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	In the Matter of: Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3)
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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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Submitted: March 28, 2012

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	Docket Nos. 50-247-LR and
)	50-286-LR
ENERGY NUCLEAR OPERATIONS, INC.)	
)	
(Indian Point Nuclear Generating Units 2 and 3))	
)	March 28, 2012

TESTIMONY OF ENTERGY WITNESSES DONALD P. CLEARY, C. WILLIAM
REAMER, AND GEORGE S. TOLLEY REGARDING
CONTENTION NYS-17B (PROPERTY VALUES)

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I. WITNESS BACKGROUND

A. Donald P. Cleary (“DPC”)

Q1. Please state your full name.

A1. (DPC) My name is Donald P. Cleary.

Q2. By whom are you employed and what is your position?

A2. (DPC) I am an Environmental Safety Consultant with Talisman International, LLC.

Q3. Please describe your educational and professional qualifications, including relevant professional activities.

A3. (DPC) My qualifications are summarized in the attached *curriculum vitae* (ENT000133). Briefly, I hold a Bachelor of Arts degree in Economics from the University of Massachusetts, Amherst, a Master of Arts degree in Economics from the University of Florida, and have taken additional graduate courses in Natural Resource Economics and Policy at the University of Michigan. I have 38 years of experience in the nuclear regulation industry. Since 2001, I have provided consulting services in the areas of environmental impacts, power and

alternate energy sources, and regional socioeconomic impacts. Prior to joining Talisman, I was a member of the U.S. Nuclear Regulatory Commission regulatory staff (“NRC Staff”) from 1973 to 2001.

During my time with the NRC, I had a lead role in developing and applying methodologies to assess various topics covered in environmental impact statements for nuclear power plant construction and operation, including such topics as the need for power (electrical generating capacity), alternative energy sources, and regional socioeconomic impacts. I also played a key role in assessing severe accident socioeconomic impacts after the Three Mile Island Unit 2 (“TMI-2”) accident.

Of particular relevance here, as NRC Section Leader of the Regional Impact Analysis Section, I oversaw the Staff review of socioeconomic impacts in licensing nuclear power plants. Further, I oversaw the development of research projects to better understand nuclear power plant construction and operation socioeconomic impacts in order to better focus licensing reviews and support environmental impact statements. These projects included a major study of nuclear power plant construction and operation socioeconomic impacts. That study was published in 1982 as NUREG/CR-2749, “Socioeconomic Impacts of Nuclear Generating Stations.” NUREG/CR-2749 was a twelve volume series, one volume for each of twelve nuclear generating stations studied, that covered socioeconomic topics such employment, housing, land use patterns, and taxes.

In addition, through a grant, the NRC supported the property value studies of Hays B. Gamble and Rodger H. Downing, whose primary research is contained in two NRC published reports. *See* NUREG/CR-2063, *Effects of the Accident at Three Mile Island on Residential Property Values and Sales* (Apr. 1981) (ENT000134); NUREG/CR-0454, *Effects of Nuclear*

Power Plants on Community Growth and Residential Property Values (Nov. 1978)

(ENT000135). The results of these two studies were also published in “Effects of Nuclear Power on Residential Property Values,” *Journal of Regional Science* 22 (1982), pp. 457-478

(ENT000145).

Furthermore, as Task Manager for NUREG-1437, the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (May 1996) (“GEIS”) (NYS00131A-I), I was directly involved in license renewal socioeconomic impact studies. I also managed several rulemakings, and the writing of technical and policy papers related to reactor license renewal.

Additionally, while at the NRC, I also developed an in-house training unit, “Compliance with the National Environmental Policy Act in U.S. Nuclear Regulatory Commission Rulemaking and Licensing” and, with participation from the NRC Office of General Counsel and the Environmental Protection Agency (“EPA”), led periodic training sessions. During 1995 and 1996, I taught a course titled, “Environmental Policy Making” in a Master degree program at Johns Hopkins University.

As a teacher of environmental policy and as a practitioner of environmental impact analysis, I am very familiar with the NRC’s requirements and guidance on the treatment of land use and property values in nuclear power plant license renewal reviews. The major documents articulating the NRC’s requirements and guidance include NRC’s environmental protection regulations in 10 C.F.R. Part 51; the GEIS (NYS00131A-I); Regulatory Guide 4.2, Supplement 1, Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses (Sept. 2000) (“Regulatory Guide 4.2, Supp. 1”) (ENT000136); and NUREG-1555, Supplement 1, “Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Operating License Renewal” (Mar. 2000) (NUREG-1555, Supp. 1)

(ENT00019B). Also, in support of this testimony, I have reviewed the socioeconomic evaluations from select supplemental environmental impact statements for other NRC operating license renewal proceedings.

Q4. Please describe the basis for your familiarity with Indian Point Energy Center (“IPEC” or “Indian Point”), and the Indian Point Nuclear Generating Units 2 and 3 (“IP2” and “IP3,” respectively) license renewal project, including the associated license renewal application, environmental report, and environmental impact statement.

A4. (DPC) My initial familiarity with Indian Point developed as a member of the NRC Staff team reviewing alternative closed-cycle cooling systems in the 1970s. As part of that review, I evaluated information on the site and vicinity, and participated in an intensive site visit, which included meetings with local and county officials.

More recently, I have been retained by Entergy Nuclear Operations Inc. (“Entergy”) as an expert in connection with the adjudication of several contentions in this proceeding, including New York State (“NYS”) Contention 17/17A/17B (jointly, “NYS-17B” unless otherwise noted), NYS-37, and CW-EC-3A. In preparing my testimony, I reviewed the parties’ pleadings on Contention NYS-17B (including the various reports by Dr. Sheppard); the Atomic Safety and Licensing Board (“Board”) orders on NYS-17B; the socioeconomic information in Entergy’s Environmental Report (“ER”) (Apr. 24, 2007) (ENT00015B) and in the NRC Staff’s Final Supplemental Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3 (Dec. 2010) (“FSEIS”) (NYS001433A-J); and the license renewal GEIS (NYS00131A-I). I also have reviewed the most current land use planning documents from the Village of Buchanan, the Town of Cortlandt, the City of Peekskill, and Westchester County. *See* Village of Buchanan, Comprehensive Master

Plan (Mar. 2005) (ENT000137); Town of Cortlandt, Comprehensive Master Plan (July 2004) (ENT000138); Westchester County, Context for County and Municipal Planning in Westchester County and Policies to Guide County Planning (Jan. 2010) (ENT000139).

B. C. William Reamer (“CWR”)

Q5. Please state your full name.

A5. (CWR) My name is C. William Reamer.

Q6. By whom are you employed and what is your position?

A6. (CWR) I am a Senior Regulatory and Nuclear Safety Consultant with Talisman International, LLC.

Q7. Please describe your educational and professional qualifications, including relevant professional activities.

A7. (CWR): My qualifications are summarized in the attached *curriculum vitae* (ENT000140). Briefly, I hold a Bachelor of Arts in Political Science from Ohio University, a J.D. from Duke University, an L.L.M from the University of California at Berkeley, and am a member of the District of Columbia bar. I have over 30 years of experience in both the public and private sectors, including more than 25 years at the NRC.

Since 2006, I have provided consulting services in the areas of environmental protection, decommissioning of nuclear facilities and sites, and waste management. Prior to joining Talisman, at the NRC, I served as the Director of NRC’s High-Level Waste Repository Safety Division, where I led the establishment of NRC’s regulatory framework for a possible Yucca Mountain repository. As Deputy Director of NRC’s Division of Waste Management, I oversaw programs on environmental protection, decommissioning of nuclear facilities and sites, and low-level waste management. I also served as an officer at the 2006 meeting of the International Joint Convention on the Safety of Spent Fuel and Radioactive Waste Management and was

consulted on development of International Atomic Energy Agency standards for geologic repositories. In addition, as an attorney manager in NRC's Office of the General Counsel, I advised on licensing, certification, and regulation of spent nuclear fuel transportation, storage, and disposal; was involved in early legal proceedings involving NRC's general license for spent fuel storage; and advised on NRC's Waste Confidence Rule.

Since joining Talisman, I have continued to closely follow issues related to the Yucca Mountain repository, the decommissioning of nuclear facilities and sites, spent fuel storage, and the Commission's recent update of the Waste Confidence Rule. Thus, I am very familiar with the NRC's requirements and guidance on the decommissioning of nuclear facilities and sites, spent fuel storage, and the Waste Confidence Rule.

Q8. Please describe the basis for your familiarity with the Indian Point license renewal project, including the associated license renewal application, environmental report, and environmental impact statement.

A8. (CWR) I have been retained by Entergy as an expert in connection with the adjudication of NYS-17B. In preparing my testimony, I reviewed the parties' pleadings on Contention NYS-17B (including the various reports by Dr. Sheppard); the Board orders on NYS-17B; and the socioeconomic information in Entergy's ER and in the NRC Staff's FSEIS and the license renewal GEIS. I also have reviewed publicly available decommissioning-related documents, including Indian Point documentation. *See* NL-08-144, Letter from J. E. Pollock, Entergy, to NRC, "Unit No. 1 and 2, 10 CFR 50.54(bb) Program for Maintenance of Irradiated Fuel" (Oct. 23, 2008) (ENT000141); NL-10-123, Letter from J.E. Pollock, Entergy, to NRC, Unit 3 Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost

Analysis in Accordance with 10 CFR 50.54 (bb) and 10 CFR 50.75(f)(3) (Dec. 10, 2010)
(ENT000142).

C. George S. Tolley (“GST”)

Q9. Please state your full name.

A9. (GST) My name is George S. Tolley.

Q10. By whom are you employed and what is your position?

A10. (GST) I am President of RCF Economic & Financial Consulting, Inc., an economic and financial consulting firm that employs a number of internationally-renowned economists. In addition, I am a Professor Emeritus of Economics at the University of Chicago, where I teach courses in urban economics, environmental economics, and energy policy.

Q11. Please describe your educational and professional qualifications, including relevant professional activities.

A11. (GST) My qualifications are summarized in the attached *curriculum vitae* (ENT000143). Briefly, I hold Master and Doctorate degrees in Economics from the University of Chicago, where I have been a Professor or Professor Emeritus of Economics since 1966. I also hold an Honorary Doctoral degree from North Carolina State University, where I was a member of the faculty in the Department of Economics and Business from 1955 to 1966. I have more than 50 years of professional experience in the practice of economics and have authored or co-authored 17 books and over 100 articles in professional journals. I have held executive positions in the Federal government, including as the Deputy Assistant Secretary of the Treasury for Tax Policy and the Director of the Economic Development Division of the U.S. Department of Agriculture. I was Director of the Center for Urban Studies at the University of Chicago from 1978 to 1985. I am a Fellow of the American Association for the Advancement of Science and have served on committees of the National Academy of Science, including the Committees on

Automotive Pollution, Water Policy, and Energy Engineering. I founded and am now an Honorary Editor of the Elsevier professional journal entitled Resource and Energy Economics.

Currently, I teach hedonic modeling of property values and supervise research studies using hedonic techniques, and I have done so for many years. Earlier, I directed National Science Foundation and U.S. Environmental Protection Agency projects on estimation of economic benefits and costs from environmental impacts. As a result, I am well-versed in the economic techniques used to assess the benefits and costs of activities that may affect the environment and the development and application of methodologies, such as hedonic models, to estimate direct and indirect impacts on potential property values and to assess likely associated land use changes.

Q12. Please describe the basis for your familiarity with the Indian Point license renewal project, including the associated license renewal application, environmental report, and environmental impact statement.

A12. (GST) I have been retained by Entergy as an expert in connection with the adjudication of Contention NYS-17B. In preparing my testimony, I reviewed the parties' pleadings on Contention NYS-17B (including the various reports by Dr. Sheppard); the Board orders on NYS-17B; and the socioeconomic information in Entergy's ER and in the NRC Staff's FSEIS for Indian Point and the license renewal GEIS. I also have independently assessed the potential impacts to land use and property values for areas surrounding Indian Point. This assessment is documented in my report entitled, "Property Value Effects of Indian Point License Renewal" (Mar. 2012) ("Tolley Report") (ENT000144). As part of that assessment, I visited the area around the site to obtain a better understanding of current offsite land use and the potential for property value impacts.

II. OVERVIEW OF CONTENTION NYS-17B

Q13. Are you familiar with the NYS filings on NYS-17B, as the contention has evolved over the course of this proceeding?

A13. (DPC, CWR, GST) Yes. We have reviewed the relevant pleadings in this proceeding concerning Contention NYS-17B. As an initial matter, we note that NYS and their expert, Dr. Stephen C. Sheppard, have continually revised their arguments and theories, often in ways that appear to be inconsistent with their earlier filings. The evolving nature of NYS-17B has left a less-than-coherent theory of how, or why, NYS and Dr. Sheppard believe offsite land use and property values have or will be affected by the proposed renewal of the IP2 and IP3 operating licenses, or the no-action alternative.

Q14. With that disclaimer, please summarize your understanding of the evolution of NYS-17B.

A14. (DPC, CWR, GST) As originally proposed, NYS-17 alleged that Entergy's ER ignored alleged positive offsite land use impacts that would result from property values increases under the no-action alternative (*i.e.*, denial of the renewed operating licenses). New York State Notice of Intention to Participate and Petition to Intervene at 168 (Nov. 30, 2007) ("NYS Petition" or "NYS-17"), *available at* ADAMS Accession No. ML073400187. NYS-17 assumed that decommissioning and removal of all spent fuel would take place by 2025, at which time the site would be available for unrestricted use. NYS Petition at 168. According to NYS-17, at that time, properties adjacent to Indian Point would be available for "beneficial uses" and would increase in value. NYS Petition at 168.

To support this theory, NYS-17 relied on the 2007 Sheppard Report, which indicated that putting the site to its "highest and best alternative use" would involve "a combination of attractive riverfront development that would be likely to include employment and other attractive

locations.” Stephen Sheppard, *Potential Impacts of Indian Point Relicensing on Property Values* at 3 (Nov. 29, 2007) (“2007 Sheppard Report”) (NYS000226). Dr. Sheppard estimated that removal of Indian Point facilities and spent fuel would increase property values within two miles of the site by \$576 million and that this would cause property owners to alter their decisions about land use. 2007 Sheppard Report at 6 (NYS000226).

Following issuance of the DSEIS, NYS submitted NYS-17A, which argued that the DSEIS similarly ignored the alleged property value impacts flowing from the no-action alternative. State of New York Contentions Concerning NRC Staff’s Draft Supplemental Environmental Impact Statement at 15 (Feb. 27, 2009) (“NYS DSEIS Contentions” or “NYS-17A”) *available at* ADAMS Accession No. ML090690303. As support for NYS-17A, NYS referenced the previously-filed 2007 Sheppard Report as well as a new 2009 Sheppard Report. NYS DSEIS Contention at 18-20. Using the alleged \$576 million impact from the earlier report, Dr. Sheppard, in his 2009 Report, applied a 3.25 percent discount rate, and compared a no-action option assuming decommissioning and removal of all spent fuel would take place by 2025 with license renewal options delaying decommissioning and spent fuel removal until sometime between 2095 and 2155 (*i.e.*, 60 to 140 years beyond 2035). *See* Stephen Sheppard, *Potential Impacts of Indian Point Relicensing with Delayed Site Reclamation* at 2, 3-4, (Feb. 26, 2009) (“2009 Sheppard Report”) (NYS000227). Dr. Sheppard found that such delays would impose an alleged present value \$300 million to \$340 million burden on nearby properties, depending on the date of decommissioning assumed. *See Potential Impacts of Indian Point Relicensing with Delayed Site Reclamation* at 2-5.

After the NRC issued a final updated Waste Confidence Rule and also separately issued the FSEIS, NYS submitted NYS-17B, which included numerous new bases related to the Waste

Confidence Rule, an alternative request for waiver or exemption from that rule, and sought to apply the already-admitted contention to the FSEIS. State of New York's Request for a Determination That the Proposed Amended Bases for Contention 17A Are Not Barred by 10 C.F.R. § 51.23(b), or That Exemption from the Requirements of 10 C.F.R. § 51.23(b) Should Be Granted, or That the State Has Made a *Prima Facie* Case That § 51.23(b) Should Be Waived as Applied to Contention 17B at 6-9 (Jan. 24, 2011) ("Contention NYS-17B"), available at ADAMS Accession No. ML110390250. To support these new arguments, NYS included the January 2011 Sheppard Report, which presented a no-action alternative "baseline" and four other scenarios with various decommissioning and spent fuel removal dates. See Stephen Sheppard, *Potential Economic Impacts Related to Property Value Diminution in Communities Surrounding the IPEC* at 1, 3-6 (Jan. 24, 2011) (NYS000230) ("January 2011 Sheppard Report").

Q15. Please describe the no-action alternative "baseline" and the other scenarios in the January 2011 Sheppard Report.

A15. (DPC, CWR, GST) Dr. Sheppard's no-action "baseline" alternative assumed completion of decommissioning and spent fuel removal in 2047, and the other scenarios assumed dates ranging from 2077 to 2137. See January 2011 Sheppard Report at 3-4 (NYS000230). Again relying on the earlier alleged \$576 million impact of the no-action alternative, the January 2011 Sheppard Report applied a 4 percent discount rate and thus found that the impact of the license renewal scenarios was \$169 million to \$237 million greater than the no-action alternative again depending on the assumed decommissioning scenario. January 2011 Sheppard Report at 1, 4-6 (NYS000230).

Q16. Are you familiar with the Board’s contention admissibility decisions?

A16. (DPC, CWR, GST) Yes. The Board originally admitted NYS-17 as a “contention of omission,” explaining that, “[i]n conducting its analysis of the impact of license renewal on land use, Entergy should have considered the impact on real estate values.” *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 & 3), LBP-08-13, 68 NRC 43, 116 (2008). In this regard, the Board found that NRC regulations do not limit consideration of offsite land use to tax-driven land use changes. LBP-08-13, 68 NRC at 116.

Subsequently, the Board determined that NYS-17A updated the original contention “to reflect that New York contends that the NRC Staff erred in a similar manner to Entergy and that the original contention is now relevant to the [DSEIS], as well as to the ER,” and thus, admitted NYS-17A and consolidated it with NYS-17. Licensing Board Order (Ruling on New York State’s New and Amended Contentions) at 8 (June 16, 2009) (unpublished).

The Board later determined that NYS-17B differed from previously admitted NYS-17/17A “primarily in the substitution of the FSEIS for the DSEIS” and thus admitted NYS-17B and consolidated it with NYS-17/17A. Licensing Board Memorandum and Order (Ruling on Pending Motions for Leave to File New and Amended Contentions) at 16 (July 6, 2011) (“July 6, 2011 Order”) (unpublished).

Q17. How did the Board treat the Waste Confidence aspects of NYS-17B?

A17. (DPC, CWR, GST) The Board denied NYS-17B to the extent that it proposed new bases related to the Waste Confidence Rule. *See* July 6, 2011 Order at 16. The Board found the NYS argument concerning the timeframe for spent fuel removal from the site and the Waste Confidence Rule “irrelevant because the Waste Confidence Rule has never specified a timetable for the removal of spent fuel and NRC regulations have long envisioned the possibility of spent

fuel remaining on reactor sites until the end of site decommissioning.” July 6, 2011 Order at 16. The Board also declined to consider NYS’s request for exemption and waiver from the Waste Confidence Rule. See July 6, 2011 Order at 18.

In the July 6 Order, the Board also ruled that “to argue that the presence of spent fuel itself on the site affects property values is to assert that there is an environmental impact from the presence of spent fuel that must be assessed on a site-specific basis, contradicting the language of the Waste Confidence Rule . . . which states that there is no such requirement.” July 6, 2011 Order at 17. The Board also clarified that “any incremental impact of spent fuel alone need not be given any role in assessment of property values” and “whatever hypothesized impact IPEC has on property values during the period of extended operations is not affected to a measurable degree by any one component (including the presence or absence of spent fuel).” Licensing Board Memorandum and Order (Granting Entergy’s Request for Clarification) at 4 (Aug. 10, 2011) (unpublished).

Q18. Have you also reviewed the pleadings associated with Entergy’s motion for summary disposition?

A18. (DPC, CWR, GST) Yes. We reviewed those pleadings, including the “State of New York’s Response to Entergy’s Motion for Summary Disposition on New York Contentions 17 and 17A” (Mar. 18, 2010) (“NYS Summary Disposition Response”), *available at* ADAMS Accession No. ML100880169; the Supplemental Declaration of Stephen C. Sheppard (Mar. 5, 2010) (“2010 Sheppard Declaration”) (NYS000229); and the report entitled “Determinants of Property Values” (Mar. 15, 2010) (“2010 Sheppard Report”) (NYS000228). Although it vaguely referenced “nuisance and disamenity,” the 2010 Sheppard Report did not otherwise specify the cause of the alleged property value impact. 2010 Sheppard Report at 2 (NYS000228). The only

place NYS provided explicit indication of the potential for physical environmental impacts (*e.g.*, aesthetics, noise, and onsite groundwater contamination reaching the Hudson River) to effect property values was in the NYS Summary Disposition Response (at 7-8). Dr. Sheppard, however, does not cite or otherwise appear to rely on such information.

Q19. Are you familiar with the Board’s order on Entergy’s motion for summary disposition?

A19. (DPC, CWR, GST) Yes. We have reviewed the Board’s order ruling on Entergy’s motion for summary disposition. Although it denied summary disposition, the Board agreed with Entergy that National Environmental Policy Act (“NEPA”) “contentions relating to on-site spent fuel storage are outside the scope of this proceeding due to the Waste Confidence Rule (codified as 10 C.F.R. § 51.23).” *See* Licensing Board Memorandum and Order (Denying Entergy’s Motion for the Summary Disposition of NYS Contention 17/17A) at 13 (Apr. 22, 2010) (unpublished) (citations omitted) (“Apr. 22, 2010 Order”). The Board also found that a question of fact existed regarding whether there was a “reasonably close causal relationship” between any changes to the physical environment resulting from the no-action alternative and the property value impact alleged by NYS. *See* Apr. 22, 2010 Order at 12. The Board further found that a question of fact existed concerning the likelihood of offsite land use changes in the areas near the Indian Point site under the no-action alternative. *See* Apr. 22, 2010 Order at 13. Our subsequent testimony addresses these factual questions.

Q20. Have you reviewed the NYS initial written statement of position, prefiled direct testimony, and supporting exhibits concerning NYS-17B, as filed on December 17, 2011, and revised on January 30, 2012?

A20. (DPC, CWR, GST) Yes. We have each individually reviewed Dr. Sheppard's prefiled direct testimony (NYSR00224), reports and declarations (NYS000225 through NYSR00231), and other supporting exhibits related to NYS-17B. Our testimony fully addresses the specific concerns and arguments presented by NYS.

Q21. Have you reviewed other materials in preparation for your testimony?

A21. (DPC, CWR, GST) Yes. We note at the outset that we cannot offer legal opinions on the language of the NRC regulations, orders, or related NRC guidance, discussed in our testimony. However, reading statement therein as technical statements, and using our expertise, we can interpret what those statements mean for NEPA offsite land use and property value impact evaluations.

Q22. What is the source of those materials?

A22. (DPC, CWR, GST) Many are documents prepared by government agencies, peer reviewed articles, or documents prepared by or for Entergy or the utility industry related to socioeconomic impacts. These documents include, for example, NRC Staff's GEIS and Indian Point FSEIS, Indian Point decommissioning filings (*e.g.*, ENT000141 and ENT000142); Village of Buchanan, Town of Cortlandt, and Westchester County land use planning documents (ENT000137, ENT000138, ENT000139); and property value and other economic studies primarily related to siting nuclear power plants and other types of facilities hypothesized to impact property values (*e.g.*, D. Clark, L. Michelbrink, T. Allison, and W. Metz, *Nuclear Power*

Plants and Residential Housing Prices, 28 Growth & Change 496 (Fall 1997) (NYS000236); H. Gamble and R. Downing, *Effects of Nuclear Power Plants on Residential Property Values*, 22 J. of Regional Sci. 457 (1982) (ENT000145).

Q23. I show you what has been marked as Exhibit ENT000001. Do you recognize this document?

A23. (DPC, CWR, GST) Yes. It is a list of Entergy's exhibits, and includes those documents which we referred to, used, or relied upon in preparing respective portions of our testimony, ENT00015B, ENT00019B, and ENT000133 through ENT000181.

Q24. I show you Exhibits ENT00015B, ENT00019B, and ENT000133 through ENT000181. Do you recognize these documents?

A24. (DPC, CWR, GST) Yes. These are true and accurate copies of the documents that we have referred to, used and/or relied upon in preparing this testimony. Where we have attached only a document excerpt as an exhibit, that is noted on Entergy's exhibit list.

Q25. How do these documents relate to the work that you do as an expert in forming opinions such as those contained in this testimony?

A25. (DPC, CWR, GST) These documents represent the type of information that persons within our respective fields of expertise reasonably rely upon in forming opinions of the type offered in this testimony.

III. SUMMARY OF DIRECT TESTIMONY AND CONCLUSIONS

Q26. What is the purpose of your testimony?

A26. (DPC, CWR, GST) The purpose of our testimony is to explain why NYS-17B lacks merit, and why the FSEIS appropriately concludes that the offsite land use impacts under the no-action alternative are SMALL and the overall socioeconomic impacts under the no-action alternative are SMALL to MODERATE. Specifically, our testimony will explain why the

FSEIS assessment of offsite land use impacts resulting from the no-action alternative and from the proposed license renewal is consistent with NRC guidance, 10 C.F.R. Part 51 regulations, and NEPA. Based on the NRC's well-established, comprehensive approach for assessing land use impacts, the FSEIS appropriately focuses on the two license renewal effects most likely to cause offsite land use impacts—tax revenue effects and population change effects. Our testimony fully examines NYS's claim of additional, allegedly-unexamined property value-driven land use impacts and confirms the FSEIS's conclusion of SMALL offsite land use impacts.

Q27. Please summarize the bases for your disagreement with the claims made by NYS and their proffered witness in NYS-17B.

A27. (DPC, CWR, GST) First, we explain why prior Indian Point-specific reviews conducted by the NRC Staff conclude that property value impacts, and thus any property value-driven land use impacts, are SMALL. Moreover, pre-established land use development patterns in the areas surrounding Indian Point are anticipated to continue in the future, and public services and regulatory controls are in place to support and guide land use and development. ER at 4-42 (ENT00015B). Thus, even if there were hypothetical future property value changes associated with the no-action alternative or the completion of site decommissioning, any corresponding offsite land use impacts are unlikely to be significant in light of historic land use patterns, current land use regulations and zoning ordinances, tax rates and incentives, population growth trends, and pending and proposed development plans.

Second, we describe Indian Point-specific property value assessments that verified there are no adverse property value impacts associated with Indian Point. *See* Tolley Report at 22, 50 (ENT000144). These assessments use hedonic price modeling; the well-accepted and most

reliable methodology for identifying property value impacts. One assessment used Multiple Listing Service (“MLS”) data and the other used data from the same local assessor records used by Dr. Sheppard. Tolley Report at 15, 48 (ENT000144). Both assessments demonstrate that proximity to Indian Point has no discernible adverse impact on residential property values, a conclusion that is consistent with other studies of nuclear power plants. Tolley Report at 50 (ENT000144). Accordingly, the absence of any adverse property value impact caused by Indian Point means that there are no unexamined property value-driven land use impacts and that there cannot be the windfall economic recovery under the no-action alternative as NYS alleged.

Finally, we also address the evaluations Dr. Sheppard presents in his prefiled testimony and reports, and demonstrate that his various criticisms lack factual or technical merit. For multiple, independent reasons, each of Dr. Sheppard’s reports are invalid and reach unreasonable and unsupported conclusions. Although the errors in those reports are too numerous to list in this summary, we briefly note here that Dr. Sheppard’s original reports are based on a 1974 study involving a coal plant that is simply inapplicable to the area surrounding Indian Point. Tolley Report at 29 (ENT000144). Using this coal-plant derived property value impact estimate to compare the impacts of license renewal to the impacts of the no-action alternative, Dr. Sheppard makes unjustifiable assumptions about PILOT payments, decommissioning timeframes, and the discounting of alleged future property value changes that severely bias his results. Tolley Report at 31-34 (ENT000144).

Dr. Sheppard’s most recent approach, which he says is similar “in spirit” to “event studies” used to examine values of stocks and other financial assets (*see* Stephen Sheppard, *Impacts of the Indian Point Energy Center on Property Values* at 3 (Dec. 11, 2011) (“December 2011 Sheppard Report”) (NYSR00231)), is in fact an unprecedented and unreliable approach for

estimating property value impacts. Among the numerous flaws in this evaluation, Dr. Sheppard's work contained an extraordinary number of data entry errors, contains invalidly defined "control" and "treatment" groups, incorrectly assumes that the full power operations of IP2 and IP3 was an "event" that resulted in an alleged property value impact, and violates many other requirements for a valid "event study." *See* Tolley Report at 37-47 (ENT000144). Thus, when these additional flaws are properly accounted for, it is clear that Dr. Sheppard's testimony contains nothing that calls into question NRC Staff's conclusion that the no-action alternative would result in SMALL offsite land use impacts.

IV. BACKGROUND ON NEPA REQUIREMENTS, NRC IMPLEMENTING REGULATIONS, AND THE LICENSE RENEWAL GEIS

Q28. Please describe the general requirements of NEPA that are applicable to the claims in NYS-17B.

A28. (DPC, CWR) NEPA requires that federal agencies, such as the NRC, prepare an environmental impact statement ("EIS") in conjunction with every major Federal action "significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C). An EIS must discuss "the environmental impact of the proposed action." 42 U.S.C. § 4332(2)(C)(i). An EIS also must include a detailed statement on "alternatives to the proposed action." 42 U.S.C. § 4332(2)(C)(iii). The NRC's regulations implementing NEPA are codified in 10 C.F.R. Part 51.

Q29. Please describe the NEPA requirement to consider the environmental impacts of a proposed action, including its applicability to a license renewal proceeding.

A29. (DPC, CWR) NRC's NEPA regulations require the consideration of both "direct" and "indirect" impacts resulting from the proposed action. *See* 10 C.F.R. Pt. 51, Subpt. A, App. A, § 7(a)-(b). These two terms are defined in Council on Environmental Quality ("CEQ") regulations, and these CEQ definitions are used by the NRC in implementing NEPA.

See 10 C.F.R. § 51.14(b). Direct impacts are caused by the action and occur at the same time and place as the proposed action. 40 C.F.R. § 1508.8(a). Indirect impacts are caused by the action, but are later in time or farther removed in distance, yet still reasonably foreseeable. 40 C.F.R. § 1508.8(b).

In a license renewal proceeding, past plant construction and current operating experience may be considered to establish the environmental “baseline.” *See* Proposed Rule, Environmental Review for Renewal of Operating Licenses, 56 Fed. Reg. 47,016, 47,020 (Sept. 17, 1991) (NYS000125). License renewal impacts, if any, are determined by assessing changes that may result from license renewal and comparing them to this baseline. *See* Proposed Rule, Environmental Review for Renewal of Operating Licenses, 56 Fed. Reg. 47,016, 47,020 (Sept. 17, 1991) (NYS000125). Thus, rather than separately evaluating the environmental effects of individual past actions, NRC takes existing conditions as the baseline from which to measure any different impacts from license renewal. *See* CEQ Guidance on Consideration of Past Action in Cumulative Effects Analysis 1-2 (June 24, 2005) (ENT000146).

Q30. Please describe the NEPA requirement to consider the “no-action alternative,” including its applicability to a license renewal proceeding.

A30. (DPC, CWR) NRC regulations require the consideration of the “no-action” alternative. 10 C.F.R. Pt. 51, App. A § 4. In a license renewal proceeding, the no-action alternative involves examining the potential environmental impacts associated with denying the license renewal application instead of renewing the operating licenses for an additional 20-year period. *See* NUREG-1555, Supp. 1, at 8.1-3 (ENT00019B). Where an agency’s choice of “no action” would result in predictable actions by others, these consequences should be included in the analysis. CEQ, Memorandum to Agencies: Answers to 40 Most Asked Questions on NEPA

Regulations, 46 Fed. Reg. 18,026, 18,027 (Mar. 23, 1981) (Question 3) (ENT000147). Under NEPA's rule of reason, however, the NRC need not look at every conceivable impact, but only at reasonably foreseeable impacts. *See* 40 C.F.R. §§ 1508.7, 1508.8(b).

Section 8.2 of the GEIS discusses the no-action alternative, which is defined as the denial of the proposed renewed operating license. GEIS at 8-2 (NYS00131D). The GEIS notes that denying the renewed license would lead to site decommissioning and associated impacts. GEIS at 8-2, 8-15 (NYS00131D). Although decommissioning eventually would take place even if the renewed licenses are granted, to the extent that the environmental impacts resulting from decommissioning would be different if the licenses are denied, those differences should be considered as part of the no-action alternative. *See* GEIS at 7-1 (NYS00131D).

Q31. Is there a general requirement under NEPA to consider offsite land use and property value impacts?

A31. (DPC, CWR) No. There is no general NEPA requirement to consider offsite land use and property value impacts in all NEPA analyses. But, in some cases, such impacts must be addressed if they are sufficiently connected to the agency action. As previously noted, NRC regulations require the consideration of indirect impacts resulting from the proposed action. *See* 10 C.F.R. Pt. 51, Subpt. A, App. A § 7(b). As related to NYS-17B, indirect impacts may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. 40 C.F.R. § 1508.8(b).

Although NEPA requires the consideration of indirect impacts, if those impacts are socioeconomic, then they need only be addressed when interrelated with actual physical effects. *See* 40 C.F.R. § 1508.14. Thus, the Commission has concluded that the NRC Staff need not

consider socioeconomic effects that are not “directly related to the physical environment.” Final Rule, Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 64 Fed. Reg. 48,496, 48,502 (Sept. 3, 1999) (ENT000148). For example, the Commission found that the GEIS was not required to consider the effect that spent fuel shipments would have on property values because impacts would arise from the public’s perception of risk, rather than from an impact to the physical environment. 64 Fed. Reg. at 48,502 (ENT000148). Further, as the GEIS explains, “only those [socioeconomic impacts] directly affecting the natural and built environment are carried forward to the decision to renew an operating license.” GEIS at 4-99 (NYS00131B).

Thus, socioeconomic impacts, including property values impacts, only need to be considered in an EIS when they are caused by, or themselves cause, some physical change to the environment.

Q32. As a general matter, how does NRC characterize environmental impacts of the proposed action for license renewal?

A32. (DPC) Issues that are reviewed in NRC license renewal environmental evaluations are assigned significance levels based on the following definitions:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission’s regulations are considered small.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

10 C.F.R. Pt. 51, Subpt. A, App. B, Tbl. B-1, n.3.

Q33. Please identify how NRC regulations implementing NEPA apply to license renewal applications.

A33. (DPC) As previously noted in response to Question 28, the NRC's NEPA regulations are found in 10 C.F.R. Part 51. In 1996, the Commission amended Part 51 to make these regulations efficient and focused with respect to license renewal proceedings. *See* Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. 28,467 (June 5, 1996) (NYS000127), *amended by* 61 Fed. Reg. 66,537 (Dec. 18, 1996) (NYS000128). The NRC also prepared the GEIS to evaluate and document those environmental impacts associated with license renewal that are well understood based on experience gained from the many years of operation of the existing fleet of U.S. nuclear power plants. Based on the GEIS, the NRC divided the environmental requirements for license renewal into generic and plant-specific components, and these requirements are codified in Part 51.

Generic issues are identified in the GEIS as "Category 1" impacts. *See* GEIS at xxxv (NYS00131A). Category 1 issues are those on which the Commission found that it could draw generic conclusions that would apply to all nuclear power plants, or, alternatively, a specific group of those plants. *See* GEIS at xxxv (NYS00131A). The Commission concluded that such environmental impacts are similar for all plants, and thus need not be assessed on a site-specific basis. *See* GEIS at xxxv (NYS00131A). The NRC codified its generic findings in Table B-1, Appendix B to Subpart A of 10 C.F.R. Part 51. For example, pursuant to Table B-1, the following issues are resolved generically as Category 1 issues and were found to have SMALL impacts: noise impacts; aesthetic impacts; impacts to the public from radiation exposure during the license renewal period and during decommissioning; spent fuel storage impacts; and socioeconomic impacts during decommissioning.

Pursuant to 10 C.F.R. § 51.53(c)(3)(i), a license renewal applicant may, in its ER, refer to and, in the absence of new and significant information, adopt the generic environmental impact findings found in Appendix B, Table B-1, for all Category 1 issues. Conversely, an applicant must address direct and indirect environmental impacts for which the Commission was not able to make generic environmental findings. *See* 10 C.F.R. § 51.53(c)(3)(ii). Specifically, an ER must address those issues listed at 10 C.F.R. § 51.53(c)(3)(ii) and identified as “Category 2,” or “plant specific,” issues in Table B-1. In its ER, an applicant also must include “any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.” *See* 10 C.F.R. § 51.53(c)(3)(iv).

Following on the applicant’s ER, the NRC Staff must itself then prepare a site-specific supplement to the GEIS that evaluates applicable site-specific Category 2 issues and any “new and significant information.” *See* 10 C.F.R. §§ 51.71(d), 51.95(c)(3).

Q34. Please identify any issues addressed in Table B-1 that are relevant to NYS-17B.

A34. (DPC) As admitted, NYS-17B concerns offsite land use impacts. Table B-1 lists offsite land use impacts (license renewal term) as a Category 2 (*i.e.*, site-specific) issue because, such impacts may be SMALL, MODERATE, OR LARGE, and because “[s]ignificant changes in land use may be associated with population and tax revenue changes resulting from license renewal.”

Separate from offsite land use, but relevant to the NYS-17B claims concerning property value-driven impacts, Table B-1 also lists housing impacts as a Category 2 issue. As discussed later, the potential housing impacts the GEIS considers include housing marketability impacts. But Table B-1 indicates that housing impacts “are expected to be of small significance at plants

located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect.”

Q35. Please identify any issues addressed in Table B-1 that are responsible for causing the property value impact alleged by Dr. Sheppard.

A35. (DPC) Other than a vague reference to Indian Point as “nuisance and disamenity” (2010 Sheppard Report at 2 (NYS000226)), Dr. Sheppard is unclear about the cause of the alleged current adverse property value impact.

Q36. Are there any issues in Table B-1 related to the NYS allegations of offsite property values because of aesthetic impacts, noise impacts, and human health impacts (see NYS Summary Disposition Response at 7-8)?

A36. (DPC) Yes. These are Category 1 issues (*i.e.*, generically resolved issues). Specifically, as previously noted in response to Question 33, the following issues were resolved generically and were found to have SMALL impacts: noise impacts; aesthetic impacts; impacts to the public from radiation exposure during license renewal and during decommissioning; spent fuel storage impacts; and socioeconomic impacts during decommissioning. Therefore, absent new and significant information, which NYS has not alleged here, the Commission has already determined that these Category 1 issues have SMALL impacts.

Q37. Please summarize the methodology used in the GEIS to assess offsite land use impacts.

A37. (DPC) To evaluate potential socioeconomic impacts, including offsite land use impacts, which are a subset of the socioeconomic issues the GEIS addresses, the NRC Staff conducted an extensive literature review, a search of newspaper citations, a survey of all nuclear utilities, and detailed case studies of seven nuclear power reactor sites, including Indian Point.

See GEIS at C-3 to -6 (NYS00131F). The GEIS methodology involves first identifying land use impacts from construction and operation, and then using this information to project future land use impacts during the license renewal period. GEIS at C-34 (NYS00131F); *see also generally* GEIS, App. C at C-34 to -35, C-89 (NYS00131F-G).

To identify the offsite land use impacts that occurred during construction and operation, and the likely issues of concern in assessing license renewal impacts, the NRC Staff reviewed environmental impact statements for a number of nuclear plants as well as site-specific reports for the seven case study sites, one of which was Indian Point. *See* GEIS at C-34 (NYS00131F). Based on this review, the NRC Staff identified the following potential land use issues:

(1) changing land use patterns influenced by plant location, plant-related population growth, and plant tax payments; (2) changing residential, commercial, and industrial development rates and patterns influenced by plant location, plant-related population growth, and plant tax payments; and (3) changing land use regulations or zoning patterns resulting from plant-induced changes in land use and development. GEIS at C-35 (NYS00131F).

After identifying these potential issues, the NRC Staff conducted telephone surveys with local planners, economic development specialists, and realtors in the seven case study areas. GEIS at C-35 (NYS00131F). It combined the results from these surveys with results of a literature review to develop factors that are most useful in predicting land use impacts. GEIS at C-35 (NYS00131F). The Staff compared these impact predictors to the actual impacts observed at the seven case study sites to help assess the relationship between the predictors and impact significance levels. GEIS at C-35 (NYS00131F). Next, the NRC Staff projected the impacts of plant refurbishment and license renewal for each case study based on the impact predictor

relationships, existing local land use and development patterns, and the significance of past land use impacts. GEIS at C-35 (NYS00131F).

Q38. Please describe the findings of the GEIS evaluation of offsite land use impacts during the license renewal term.

A38. (DPC) Section 4.7.4 of the GEIS discusses offsite land use impacts during the license renewal period. *See* GEIS at 4-107 to 4-109 (NYS00131B). Based on the extensive NRC Staff review described in response to the previous question, the GEIS identifies only two mechanisms by which license renewal could impact local land use and development patterns: (1) plant-related population growth; and (2) local governments using the plants' tax payments to provide public services that encourage development. GEIS at 4-108 (NYS00131B). Regardless of the cause of the offsite land use changes, the GEIS categorizes the scope of such impacts as follows:

Small impacts result if very little new development and minimal changes to an area's land use pattern result.

Moderate impacts result if considerable new development and some changes to the land use pattern occur.

Large impacts result if large-scale new development and major changes in the land use pattern occur.

GEIS at 4-107 to -108 (NYS00131B). In addition, the GEIS points out that the same land use changes may be perceived by some community members as adverse, and by others as beneficial. GEIS at 4-109 (NYS00131B). This is part of the reason why land use changes are not addressed generically in Part 51.

Q39. Turning first to potential land use impacts resulting from plant-related population growth, please describe the GEIS findings and conclusions.

A39. (DPC) The GEIS finds that projected population growth related to worker immigration in the license renewal term would result in small land use impacts for all of the socioeconomic case study areas (which included Indian Point). GEIS at 4-108 (NYS00131B). Further, the GEIS projects that new population-driven land use changes during the license renewal term at all nuclear plants will be small because population growth caused by license renewal will represent a much smaller percentage of the local area's total population than has operations-related growth. GEIS at 4-108 to -109 (NYS00131B).

Q40. Turning next to potential tax-driven land use impacts, please describe the GEIS findings and conclusions.

A40. (DPC) The GEIS tax-driven land use impact assessment considers: (1) the size of the plant's tax payments relative to the local community's total revenues; (2) the nature of the community's existing land use pattern; and (3) the extent to which the community already has public services in place to support and guide development. GEIS at 4-108 (NYS00131B). Based on these considerations, the GEIS projects that new tax-driven land use changes might vary from site to site. GEIS at 4-108 (NYS00131B). Furthermore, because these land use changes may be perceived by some community members as adverse and by others as beneficial, the GEIS does not assess generically the potential significance of site-specific offsite land use impacts. GEIS at 4-109 (NYS00131B).

Therefore, although the GEIS finds that population-driven land use changes would be small for all plants, the NRC was unable to generically classify offsite land use impacts during

the license renewal term as a Category 1 issue because tax-driven land use changes could range from small to large depending on the site. GEIS at 4-108 to -109 (NYS00131B).

Q41. Please describe NRC license renewal guidance addressing offsite land use impacts.

A41. (DPC) Regulatory Guide 4.2, Supp. 1 and NUREG-1555, Supp. 1 provide detailed guidance for preparation of a license renewal SEIS and cover all issues addressed in the GEIS. *See* Regulatory Guide 4.2, Supp. 1, at 4.2-S-1 (ENT000136); NUREG-1555, Supp. 1, at 6 (ENT00019B). Section 4.17.2 of Regulatory Guide 4.2, Supp. 1 and Section 4.4.3 of NUREG-1555, Supp. 1 address offsite land use impacts and incorporate lessons-learned from the GEIS case study evaluations. This guidance describes the steps for analyzing offsite land use impacts associated with continued operations during the renewal terms as follows:

- Determine the new land-use impacts that could result from plant-related population growth or from the use by local governments of the plants' tax payments to provide public services that encourage development.
- Predict the geographic distribution of new development, if any.
- Estimate the effects of in-migrants and induced economic activity on offsite land use.

NUREG-1555, Supp. 1, at 4.4.3-4 (ENT00019B); *see also* Regulatory Guide 4.2, Supp. 1, at 4.2-S-42 (ENT000136).

Q42. Please summarize the methodology used in the GEIS to assess housing impacts.

A42. (DPC) As part of the socioeconomic impact assessment, but separate from the consideration of offsite land use impacts, the GEIS considers housing impacts. The GEIS methodology involves first identifying housing impacts from construction and operation, and

then using this information to project future housing impacts during the license renewal period. *See* GEIS at C-24 (NYS00131F); *see also generally* GEIS at C-24 to -25, C-82 (NYS00131F-G). To identify housing impacts that occurred during construction and operation, and the likely issues of concern in assessing license renewal impacts, the NRC Staff reviewed data from the U.S. Census and local agencies, and conducted interviews with local government officials, planners, and realtors. GEIS at C-24 (NYS00131F). These sources provided information about past impacts, which was then used to project potential future license renewal impacts, including changes in the number of housing units available (*e.g.*, the rate of growth in housing stocks), changes in occupancy rates, changes in the characteristics of housing stocks, and changes in rental rates and property values. *See* GEIS at C-24 to -25 (NYS00131F).

Q43. Please describe the findings of the GEIS evaluation of housing impacts during the license renewal term.

A43. (DPC) Section 4.7.1 of the GEIS discusses housing use impacts during the license renewal period, including impacts to property values (referred to as housing marketability impacts). *See* GEIS at 4-101 to 4-103 (NYS00131B). The GEIS identifies two potential types of housing issues: (1) demand impacts; and (2) marketability impacts. GEIS at 4-101 (NYS00131B). Both issues are discussed further below.

In the housing demand assessment, large impacts would be caused by a large workforce wanting to move into the region relative to the existing stock of housing in the region; a matter of supply and demand, which would be expected to increase housing values. *See* GEIS at 4-101 to -102 (NYS00131B). The GEIS found that no demand-related impacts are expected during normal plant operations, but that during periodic refueling outages, housing demand impacts may range from small to large, depending on the site. *See* GEIS at 4-102 to -103 (NYS00131B).

For the housing marketability evaluation, the GEIS finds that at all case study sites—including Indian Point—only small impacts on housing value and marketability are projected during the license renewal term. GEIS at 4-103 (NYS00131B). In reaching this conclusion, the GEIS notes that the prevailing belief of realtors and planners in communities surrounding the case study sites is that the nuclear plants have had little if any effect on the marketability or value of homes in the vicinity. GEIS at 4-103 (NYS00131B). It also acknowledges that housing marketability impacts may be evidenced by a gradual increase in housing value with increasing distance from the plant, although it does not conclude that such an effect would be present in all, or even most cases, nor does it try to explain why such a correlation between value and distance might be present. *See* GEIS at 4-102 (NYS00131B).

In summary, the GEIS finds that no housing demand impacts are expected during normal operations and only small impacts to housing marketability are projected. The NRC, however, was unable to classify housing impacts during the license renewal term as a Category 1 issue, overall, because housing demand impacts during refueling outages might range from small to large, depending on the site. GEIS at 4-103 (NYS00131B).

Q44. Please describe NRC license renewal guidance addressing housing impacts.

A44. (DPC) Regulatory Guide 4.2, Supp. 1 and NUREG-1555, Supp. 1 also address housing impacts and, again, incorporates lessons learned from the GEIS case study evaluations. This guidance focuses on the identification of housing demand impacts resulting from any plant workforce-related change. *See* Regulatory Guide 4.2, Supp. 1, at 4.2-S-38 to -39 (ENT000136); NUREG-1555, Supp. 1, at 4.4.1-4 to -5 (ENT00019B). In addition, NUREG-1555, Supp. 1 states “impacts on housing marketability and values that have occurred during operations will continue during the [license renewal] term,” and that “[a]t all case study sites, only small impacts

on housing value and marketability are projected to continue.” NUREG-1555, Supp. 1 at 4.4.1-3 (ENT00019B).

Q45. Please describe generally how the GEIS evaluation of alternatives is used for site-specific license renewal reviews.

A45. (DPC, CWR) The GEIS does not contain NRC’s final consideration of environmental impacts or acceptability of reasonable alternatives for individual license renewal reviews. GEIS at 8-1. Instead, the GEIS presents useful information to establish the starting point for individual NEPA alternatives reviews. *See* GEIS at 8-1 (NYS00131D).

Q46. Please describe the methodology and findings of the GEIS evaluation of the no-action alternative.

A46. (DPC, CWR) Section 8.2 of the GEIS discusses the no-action alternative and defines it as the denial of the proposed renewed operating license. GEIS at 8-2 (NYS00131D). Of particular relevance here, the GEIS notes that denying the renewed license would lead to site decommissioning and associated impacts. GEIS at 8-2, 8-15 (NYS00131D). Although decommissioning would eventually take place even if the renewed license is granted, to the extent that the environmental impacts resulting from decommissioning would be different if the renewed license is denied, those differences should be considered as part of the no-action alternative. *See* GEIS at 7-1 (NYS00131D).

Q47. Please describe the NRC approach to addressing spent fuel storage impacts after the cessation of operations.

A47. (CWR) To address the safety and environment impacts of spent fuel storage after cessation of reactor operations, the Commission has proceeded generically through the rulemaking process—namely through the Waste Confidence Rule, codified at 10 C.F.R. § 51.23—rather than litigating issues on a site-specific basis.

Recently, in 2010, the Commission revised its waste confidence “findings” (*i.e.*, the conclusions that support the Waste Confidence Rule). *See* Waste Confidence Decision Update, 75 Fed. Reg. 81,037 (Dec. 23, 2010) (ENT000149) (“2010 Waste Confidence Decision”); Final Rule, Consideration of Environmental Impacts of Temporary Storage of Spent Fuel After Cessation of Reactor Operation, 75 Fed. Reg. 81,032 (Dec. 23, 2010) (NYS000237). The effect of the amended rule is to continue the Commission’s long-standing generic treatment of the safety and environment impacts of spent fuel storage via rulemaking which precludes litigation of such issues in individual licensing proceedings. Relying now on the Commission’s 2010 Waste Confidence Decision, 10 C.F.R. § 51.23(b) remains unchanged, and continues to state that:

[N]o discussion of any environmental impact of spent fuel storage in reactor facility storage pools or independent spent fuel storage installations (ISFSI) for the period following the term of the reactor operating license . . . for which application is made, is required in any environmental report, environmental impact statement, . . . or other analysis prepared in connection with the issuance . . . of an operating license for a nuclear power reactor under parts 50 and 54 of this chapter

Thus, 10 C.F.R. § 51.23(b) applies to “any environmental impact.” Furthermore, 10 C.F.R. § 51.95(c)(2) provides that “the supplemental environmental impact statement prepared at the license renewal stage need not discuss . . . any aspect of the storage of spent fuel for the

facility within the scope of the generic determination in § 51.23(a) and in accordance with § 51.23(b).”). The regulatory history of the original Waste Confidence Rule confirms that the rule covers all environmental impacts, and does not exclude non-radiological, socioeconomic, or land use impacts. *See* Waste Confidence Decision, 49 Fed. Reg. 34,658, 34,665 (Aug. 31, 1984) (ENT000150). Thus, all environmental impacts of spent fuel storage following the license renewal period have been, and continue to be, outside the scope of individual license renewal proceedings.

V. SUMMARY OF RELEVANT EVALUATIONS IN THE ER

A. Socioeconomic Impacts Resulting from License Renewal

Q48. Please summarize the relevant background discussions in the ER concerning offsite land use.

A48. (DPC) Section 2.8 of the ER provides background information on land use planning in the areas around Indian Point. Because Indian Point is located on the eastern bank of the Hudson River, in the Village of Buchanan, in the Town of Cortlandt, in upper Westchester County, New York, the ER focuses on those jurisdictions. *See* ER at 2-47 to -53 (ENT00015B).

As the ER indicates, the Town of Cortlandt encompasses approximately 34.5 square miles and land use is predominately zoned residential. ER at 2-50 (ENT00015B). Growth in the Town of Cortlandt was intentionally slowed over the past several decades to allow for planned development, but significant commercial development has taken place along major transportation corridors and near new community facilities within the area. ER at 2-50 (ENT00015B).

In addition, the ER indicates that the Village of Buchanan encompasses 1.4 square miles and land use in the Village has changed very little over the last 20 to 30 years. ER at 2-50 (ENT00015B). The Village of Buchanan has zoning ordinances, subdivision ordinances, and a development review board. ER at 2-50 (ENT00015B).

With regard to future land use trends, the ER notes that because urban sprawl is an important issue in New York, land use and development is regulated. ER at 2-52 (ENT00015B). In fact, the Town of Cortlandt has been successful in maintaining open space and protecting its environment and natural resources. ER at 2-52 to -53 (ENT00015B).

Q49. Please summarize the relevant evaluations in the ER concerning offsite land use land use impacts resulting from license renewal.

A49. (DPC) Section 4.18 of the ER evaluates the offsite land use impacts from continued operation during the license renewal term. *See* ER at 4-40 to -43 (ENT00015B). Consistent with the GEIS and Regulatory Guide 4.2, Supp. 1, the ER focuses on identifying potential new land use impacts that might result from (1) plant-related population growth; and (2) local tax-related development (*e.g.*, based on expanded public services). ER at 4-40 (ENT00015B); *see also* Regulatory Guide 4.2, Supp. 1, at 4.2-S-41 to -45 (ENT000136).

Q50. Please summarize the ER evaluation of population-driven land use changes.

A50. (DPC) The ER adopts the GEIS conclusion that new population-driven land use changes at the site during the license renewal term will be SMALL because Entergy does not anticipate that additional workers will be employed at the site during the license renewal period. ER at 4-42 (ENT00015B). In other words, no population-driven land use impacts are anticipated because no changes in the size of the Indian Point workforce are expected during the license renewal period.

Q51. Please summarize the ER evaluation of tax-driven land use changes.

A51. (DPC) The ER evaluates the potential for new land use impacts resulting from local government activities because of tax revenues paid by Entergy. ER at 4-42 (ENT00015B). As the ER notes, in 2005, Entergy paid the Village of Buchanan approximately \$1.9 million in property taxes, and paid approximately \$19.2 million in Payment-in-Lieu-of-Taxes (“PILOT”), property taxes, and other taxes to the Town of Cortlandt, Verplanck Fire District, Westchester County, and the Hendrick Hudson Central School District, and Lakeland School District. ER at 4-42 (ENT00015B). Although these tax payments represent a significant portion of local tax revenues, the impacts from tax driven offsite land use changes associated with continued operation of IP2 and IP3 are expected to be small because the area around Indian Point has (1) pre-established land use development patterns that are anticipated to continue during the license renewal term; and (2) public services and regulatory controls in place to support and guide land use and development. ER at 4-42 (ENT00015B).

Q52. What conclusion does the ER reach regarding offsite land use land use impacts resulting from license renewal?

A52. (DPC) Based on the conclusion that the population-driven and tax-driven land use changes associated with the license renewal term are both small, the ER finds that offsite land use impacts during the license renewal term would be SMALL. *See* ER at 4-42 to -43 (ENT00015B).

Q53. Please summarize the relevant background discussions in the ER concerning housing.

A53. (DPC) Section 2.9 of the ER provides background information on housing in the areas around Indian Point, including the closest five counties where most of the permanent Indian Point workforce resides (*i.e.*, Dutchess, Orange, Putnam, Rockland, and Westchester Counties). *See* ER at 2-53 to -55 (ENT00015B). The ER presents total population, total housing unit, vacancy rate, and median home value data for 1990 and 2000 in these five counties. Between 1990 and 2000, both the total population and the total housing units in these five counties increased at about the same rate. *See* ER at 2-53 (ENT00015B). Between 1990 and 2000, vacancy rates decreased and the total number of new housing units kept pace with the low to moderate population growth, while home values and rental rates showed moderate increases. ER at 2-53 (ENT00015B).

Notably, Westchester County, the county in which Indian Point is located, had significantly higher median home values and significantly greater increases in median home values than the other four counties. *See* ER at 2-54 to 2-55 (ENT00015B). The vacancy rate in Westchester County (3.5 percent) was also lower than all of the other nearby counties except for Rockland County (2.4 percent). *See* ER at 2-54 to 2-55 (ENT00015B).

Q54. Please summarize the relevant evaluations in the ER concerning housing impacts resulting from license renewal.

A54. (DPC) Section 4.14 of the ER evaluates the housing impacts from continued operation during the license renewal term. *See* ER at 4-35 to 4-37 (ENT00015B). Consistent with the GEIS and Regulatory Guide 4.2, Supp. 1, the ER focuses on identifying potential housing impacts that might result from the plant workforce in light of the size of the surrounding

population and recent growth control measures. *See* ER at 4-35 (ENT00015B); Regulatory Guide 4.2, Supp. 1 at 4.2-S-36 to -39 (ENT000136). In the ER, Entergy concludes that housing impacts from continued operation during the license renewal term would be SMALL based on the following considerations:

- IP2 and IP3 are located in a high population area;
- Entergy does not anticipate increasing the size of the Indian Point workforce during the license renewal period;
- The Indian Point workforce will continue to be a very small percentage of the population in the adjacent counties during the period of the renewed license;
- Vacancy rates and new housing units have kept pace with low to moderate growth in the area's population; and
- No refurbishment activities are required for license renewal.

See ER at 4-37 (ENT00015B).

B. Socioeconomic Impacts Resulting from the No-Action Alternative

Q55. Please provide an overview of Entergy's approach to addressing the no-action alternative in the ER.

A55. (DPC) Sections 7.3 and 8.4 of the ER evaluate the no-action alternative. *See* ER at 7-1, 8-57 to 8-66 (ENT00015B). Consistent with the GEIS and Regulatory Guide 4.2, Supp. 1, the ER defines the no-action alternative as a decision not to renew the IP2 and IP3 operating licenses. ER at 7-1, 8-57 (ENT00015B); Regulatory Guide 4.2, Supp. 1 at 4.2-S-55 (ENT000136). The ER makes clear that environmental impacts of the no-action alternative would involve impacts from decommissioning IP2 and IP3, as well as from more localized and regional socioeconomic changes. ER at 7-1, 8-63 to -67 (ENT00015B).

Q56. Please summarize the relevant discussions and evaluations in the ER concerning decommissioning impacts resulting from the no-action alternative.

A56. (DPC, CWR) As the ER explains, decommissioning impacts under the no-action alternative would not differ substantially from decommissioning impacts following license renewal. ER at 7-2 (ENT00015B). Under the no-action alternative, Entergy would continue to operate IP2 and IP3 until 2013 and 2015, respectively, then initiate decommissioning activities in accordance with NRC requirements (*i.e.*, within 60 years of permanent cessation of operations). ER at 7-2 (ENT00015B). The ER notes that decommissioning activities and related impacts do not differ under the proposed license renewal action and the no-action alternative because, under both scenarios, Entergy will eventually have to decommission all units on the site. ER at 7-2 (ENT00015B). In other words, similar decommissioning impacts would still take place under both scenarios—license renewal would only postpone those impacts for a maximum of 20 years. ER at 7-2 (ENT00015B). This point is consistent with the GEIS, which concludes that the timing of decommissioning does not substantially influence its environmental impacts. ER at 7-2 (ENT00015B); *see also* GEIS at 7-25 to -26 (NYS00131D).

Q57. Please summarize the relevant discussions and evaluations in the ER concerning localized socioeconomic impacts resulting from the no-action alternative.

A57. (DPC) Section 8.4.3.3 of the ER discusses the localized socioeconomic impacts of the no-action alternative. *See* ER at 8-63 to -67 (ENT00015B). As the ER points out, under the no-action alternative, the local community would no longer benefit from the positive economic impacts resulting from Indian Point operations, such as reduced local unemployment, significant contributions to local property tax revenue, economic support of southeastern New York, and lower energy costs. *See* ER at 8-67 (ENT00015B). For example, the ER finds that one of the

short-term impacts would be the loss of PILOT payments and other taxes to Westchester County and other local governments. ER at 8-63 (ENT00015B). Thus, the ER concludes that the impacts of license renewal are superior to those of any alternative, including the no-action alternative. *See* ER at 8-66 to -67 (ENT00015B).

VI. SUMMARY OF RELEVANT EVALUATIONS IN THE FSEIS

A. Socioeconomic Impacts Resulting from License Renewal

Q58. Please summarize the background information in the FSEIS concerning offsite land use.

A58. (DPC) Section 2.2.8.3 of the FSEIS provides background information on land use planning in the areas around Indian Point, including Westchester County, the Town of Cortlandt, and the Village of Buchanan. *See* FSEIS at 2-121 to -123 (NYS00133B). The discussion of land use in Westchester County, the Town of Cortlandt, and the Village of Buchanan in this section of the FSEIS is consistent with the information in the ER.

Q59. Please summarize the relevant findings and evaluations in the FSEIS concerning offsite land use impacts resulting from license renewal.

A59. (DPC) Section 4.4.3 of the FSEIS evaluates the offsite land use impacts from continued operations during the license renewal term. *See* FSEIS at 4-45 to -47 (NYS00133B). Consistent with the GEIS and NUREG-1555, Supp. 1, the FSEIS focuses on identifying potential new land use impacts that might result from: (1) plant-related population growth; and (2) local tax-related development. *See* FSEIS at 4-45 (NYS00133B); NUREG-1555, Supp. 1 at 4.4.3-4 to -5 (ENT00019B).

Q60. Please summarize the FSEIS evaluation of population-driven land use changes.

A60. (DPC) With regard to population-driven land use changes, the FSEIS finds that there would be no population-related land use impacts during the license renewal term beyond those already being experienced because Entergy has no plans to add non-outage employees during the license renewal period (*i.e.*, there would be no noticeable population change to drive changes in land use conditions in the vicinity of IP2 and IP3 attributable to the plant). FSEIS at 4-46 (NYS00133B).

Q61. Please summarize the FSEIS evaluation of tax-driven land use changes.

A61. (DPC) The FSEIS evaluates the potential for tax-driven land use impacts during the license renewal term. *See* FSEIS at 4-46 (NYS00133B). Although Entergy's PILOT and tax payments to local jurisdictions are substantial and make up a significant percentage of the tax revenues for these jurisdictions, the FSEIS finds that population levels and land use in the Town of Cortlandt, Village of Buchanan, and Westchester County have not changed significantly since Entergy started making these payments after purchasing the units in 2000 to 2001. FSEIS at 4-46 (NYS00133B). Given that Entergy's annual PILOT payments and property taxes would remain relatively unchanged during the license renewal period, the FSEIS concludes that there would be no revenue-related land use impacts during the license renewal term beyond those currently being experienced. *See* FSEIS at 4-46 to -47 (NYS00133B).

Q62. Please summarize the relevant background information in the FSEIS concerning housing.

A62. (DPC) Section 2.2.8.1 of the FSEIS provides background information on housing in the areas around Indian Point, including the closest four counties where approximately 84 percent of the permanent Indian Point workforce resides (*i.e.*, Dutchess, Orange, Putnam, and Westchester Counties). *See* FSEIS at 2-114 to -116 (NYS00133A-B). Rather than compare total population, total housing unit, vacancy rate, and median home value data for 1990 and 2000, as was done in the ER, the FSEIS compares data for 2000 with more recent data from 2006, which was unavailable when Entergy prepared the ER. *See* FSEIS at 2-116; Tbl. 2-8 (NYS00133B). As the FSEIS notes, from 2000 to 2006, the estimated total number of housing units in Westchester County grew by more than 6,000 units to 355,581, and the total number of occupied units declined by 4,000 units, which increased the vacancy rate to 6.3 percent, but which is still lower than the combined four county vacancy rate of 6.9 percent. FSEIS at 2-115 to -116; Tbl. 2-8 (NYS00133A-B).

Q63. Please summarize the relevant findings and evaluations in the FSEIS concerning housing impacts resulting from license renewal.

A63. (DPC) Section 4.4.1 of the FSEIS evaluates the housing impacts from continued operation during the license renewal term. *See* FSEIS at 4-43 to -44 (NYS00133B). Consistent with the GEIS and NUREG-1555, Supp. 1, the FSEIS focuses on identifying potential housing impacts that might result from any plant workforce-related change given the local population density and any local growth control measures that might restrict future housing development. *See* FSEIS at 4-43 to -44 (NYS00133B); NUREG-1555, Supp. 1, at 4.4.1-4 to -5 (ENT00019B). As the FSEIS notes, the area surrounding Indian Point is a high population area and Dutchess,

Orange, Putnam, and Westchester Counties are not subject to growth-control measures that would limit housing development. FSEIS at 4-44 (NYS00133B). The FSEIS further points out that IP2 and IP3 employment levels would remain relatively unchanged and would not create demand for new permanent housing during the license renewal period. FSEIS at 4-44 (NYS00133B). It further finds that the number of available housing units has kept pace with or exceeded the low growth in the area population. FSEIS at 4-44 (NYS00133B). Accordingly, based on this information, the FSEIS concludes that there would be no impact on permanent housing during the license renewal term beyond what is currently being experienced. FSEIS at 4-44 (NYS00133B).

Q64. Please summarize any discussion in the FSEIS about the impact that continued operations would have on property values in the area surrounding Indian Point.

A64. (DPC) NYS submitted public comments during the DSEIS comment period asserting that NRC Staff improperly failed to analyze whether continued operations, and the resulting additional spent fuel, would impact property values. *See* FSEIS at A-122 (NYS00133D). In response, the FSEIS explains that the NRC is not required to address purely economic costs and benefits of the proposed action or of alternatives to the proposed action; *i.e.*, the NRC need not discuss issues unrelated to the environmental effects of the proposed action and the alternatives. FSEIS at A-122 (NYS00133D). The FSEIS further explains that the NRC also need not address any aspect of the storage of spent fuel for the facility within the scope of the generic determination in the Waste Confidence Rule (10 C.F.R. § 51.23). FSEIS at A-122 (NYS00133D). Finally, the FSEIS explains that the Independent Spent Fuel Storage Installation (“ISFSI”), and any associated offsite land use impacts, was not within the scope of the proposed license renewal action. FSEIS at A-122 (NYS00133D).

Q65. Please summarize the NRC conclusions in the FSEIS concerning the socioeconomic impacts resulting from license renewal.

A65. (DPC) The conclusion in the FSEIS on socioeconomic impacts is based, in part, on the previously-discussed evaluation of offsite land use and housing impacts, as well as the evaluations of other site-specific Category 2 socioeconomic issues (*e.g.*, public services) and generic Category 1 socioeconomic issues (*e.g.*, aesthetic impacts). *See* FSEIS at 4-42 to -43 (NYS00133B). Based on these evaluations, the NRC Staff concludes that socioeconomic impacts resulting from license renewal would be SMALL. *See* FSEIS at 9-9 (NYS00133B).

B. Socioeconomic Impacts Resulting from the No-Action Alternative

Q66. Please provide an overview of the NRC Staff's approach to addressing the no-action alternative in the FSEIS.

A66. (DPC) As required by NRC regulations, Section 8.2 of the FSEIS evaluates the no-action alternative. *See* FSEIS at 8-20 to -26 (NYS00133C). Consistent with the GEIS and NUREG-1555, Supp. 1, the FSEIS defines the no-action alternative as the decision not to renew the IP2 and IP3 operating licenses, whereby Entergy would cease operating IP2 and IP3. FSEIS at 8-20 (NYS00133C); NUREG-1555, Supp. 1, at 8.1-3 (ENT00019B). The FSEIS makes clear that environmental impacts of the no-action alternative would include impacts from decommissioning IP2 and IP3. FSEIS at 8-20, 8-22 (NYS00133C). I would note that, while the Section 8.2 discussion recognizes that decommissioning impacts must be addressed, most of Section 8.2 focuses on more localized impacts that would occur during the time between plant shutdown and the beginning of decommissioning. This is because Section 7 of the FSEIS addresses decommissioning impacts at greater length.

Q67. Please summarize the relevant discussions and evaluations in the FSEIS concerning decommissioning impacts, including those resulting from the no-action alternative.

A67. (DPC, CWR) As just noted in the previous answer, Chapter 7 of the FSEIS evaluates the environmental impacts associated with decommissioning. *See* FSEIS at 7-1 to -4 (NYS00133C). Section 7.1 of the FSEIS explains that the GEIS evaluates the incremental decommissioning impacts associated with license renewal, and concludes that all decommissioning impacts (including socioeconomic impacts) would be SMALL. *See* FSEIS at 7-1 to -2 (NYS00133C). In accordance with the requirements of Part 51, upon determining that there is no new and significant information on these issues, the FSEIS adopts the generic decommissioning impact findings in Table B-1. *See* FSEIS at 7-2 to -3 (NYS00133C).

Consistent with the GEIS, the FSEIS finds that decommissioning impacts under the no-action alternative would not differ substantially from decommissioning impacts following license renewal. *See* FSEIS at 8-20 (NYS00133C). As the FSEIS points out, regardless of whether the IP2 and IP3 operating licenses are renewed, Entergy will eventually be required to shut down the reactors and decommission the Indian Point site. *See* FSEIS at 8-20 (NYS00133C). In other words, if the operating licenses are renewed, then shutdown and decommissioning activities would not be avoided but would only be postponed for up to an additional 20 years. FSEIS at 8-20 (NYS00133C). Similarly, regardless of whether the licenses are renewed, following the shutdown of the reactors, Entergy would initiate decommissioning of the facility in accordance with the NRC decommissioning requirements in 10 C.F.R. § 50.82. *See* FSEIS at 8-20 (NYS00133C).

Q68. Please summarize the relevant findings and evaluations in the FSEIS concerning localized land use impacts resulting from the no-action alternative.

A68. (DPC) Section 8.2 of the FSEIS also discusses the land use impacts of the no-action alternative. *See* FSEIS at 8-22 (NYS00133C). The FSEIS finds that onsite land use would not be affected immediately if IP2 and IP3 shutdown, under the no-action alternative, because plant structures and other facilities are likely to remain in place until decommissioning. FSEIS at 8-22 (NYS00133C). Thus, the FSEIS concludes that the impacts on land use under the no-action alternative would be SMALL. FSEIS at 8-22 (NYS00133C).

Q69. Please summarize the relevant findings and evaluations in the FSEIS concerning land use impacts resulting from the no-action alternative.

A69. (DPC) Section 8.2 of the FSEIS discusses the land use impacts of the no-action alternative. *See* FSEIS at 8-21, 8-22 (NYS00133C). The FSEIS finds that land use impacts are expected to be SMALL because shutting down the plant is expected to result in few changes to offsite and onsite land use, and transition to alternate uses is expected over an extended timeframe. *See* FSEIS at 8-21, 8-22 (NYS00133C).

Q70. Please summarize the relevant findings and evaluations in the FSEIS concerning other localized socioeconomic impacts resulting from the no-action alternative.

A70. (DPC) Section 8.2 of the FSEIS also discusses other socioeconomic impacts of the no-action alternative. *See* FSEIS at 8-24 to -25 (NYS00133C). Citing a study conducted by Levitan and Associates, a consultant for Westchester County, that evaluates various economic issues associated with retiring IP2 and IP3, the FSEIS finds that shutdown of IP2 and IP3 might result in increased property values of the homes in the communities surrounding the site, which would increase tax revenues to local jurisdictions. FSEIS at 8-25 (NYS00133C) (*citing* Levitan

& Assocs., Inc., *Indian Point Retirement Options, Replacement Generation, Decommissioning/Spent Fuel Issues, and Local Economic/Rate Impacts* (June 9, 2005) (“Levitan Report”) (NYS000056)). Although the Levitan Report states that property values for homeowners may increase if operations ceased, it does not explain why such a change might occur. Levitan Report at 103 (NYS000056).

The FSEIS points out, however, that Entergy paid a combined \$21.2 million in PILOT payments, property taxes, and other taxes to Westchester County, the Town of Cortlandt, the Village of Buchanan, the Verplanck Fire District, and the Hendrick Hudson Central School District in 2005, and these PILOT payments, property taxes, and other taxes paid by the Entergy account for a significant portion of revenues for these jurisdictions, helping to provide important public and community services. FSEIS at 8-24 to -25 (NYS00133C). To fully offset the revenues lost from the shutdown of IP2 and IP3, the FSEIS found that taxing jurisdictions most likely would have to compensate with higher property taxes. FSEIS at 8-25 (NYS00133C). The FSEIS found revenue losses from the cessation of IP2 and IP3 operations would affect the communities closest to and most reliant on the plant’s tax revenue and PILOT, but that if property values and property tax revenues increase, some of these effects would be mitigated. FSEIS at 8-25 (NYS00133C). Based on this evaluation, the FSEIS concludes that the socioeconomic impacts of plant shutdown would likely be SMALL to MODERATE (with MODERATE effects felt for the Hendrick Hudson Central School District, the Village of Buchanan, the Town of Cortlandt, and the Verplanck Fire District due to impacts resulting from loss of revenue). FSEIS at 8-25 (NYS00133C).

Q71. Please summarize any further discussion in the FSEIS about the impact that the no-action alternative would have on property values in the area surrounding Indian Point.

A71. (DPC) NYS submitted public comments during the DSEIS comment period requesting that the NRC consider impacts to property values under the no-action alternative. *See* FSEIS at A-157 (NYS00133D). In response, the FSEIS explains that the NRC Staff found that, under the no-action alternative, land use impacts would be SMALL and, in the discussion of socioeconomic impacts, that the denial of the licenses might result in positive impacts on property values, but might also cause reductions in tax revenues for local jurisdictions. FSEIS at A-157 (NYS00133D). The FSEIS also points out that, even under the no-action alternative, it is not likely that Indian Point would be decommissioned by 2025 (as NYS then asserted) because, among other things, denial of the license renewal application would not result in prompt removal of spent fuel from Indian Point. *See* FSEIS at A-157 to -158 (NYS00133D).

D. FSEIS Consistency with NRC Guidance and Compliance with 10 C.F.R. Part 51 and NEPA

Q72. Is the FSEIS assessment of offsite land use impacts consistent with NRC guidance?

A72. (DPC) Yes. The FSEIS assessment of offsite land use impacts from continued operations is consistent with NRC guidance in NUREG-1555, Supp. 1. As explained previously, the FSEIS examines the potential for offsite land use impacts resulting from plant-related population or local tax-related development during the license renewal term and finds that there would be no significant new land use impacts resulting from either of these issues. FSEIS at 4-46 to -47 (NYS00133B). Similarly, in addressing the no-action alternative, the FSEIS finds that land use impacts would not be significant—essentially because onsite IP2 and IP3 structures and

other facilities would likely remain in place until decommissioning. FSEIS at 8-22 (NYS00133C). Thus, the FSEIS is consistent with NUREG-1555, Supp. 1. *See* NUREG-1555, Supp. 1, at 4.4.3-4 (ENT00019B).

Q73. Does the FSEIS assessment of offsite land use impacts comply with 10 C.F.R. Part 51 and NEPA?

A73. (DPC) Yes. The FSEIS appropriately considers direct and indirect offsite land use impacts resulting from license renewal and from the no-action alternative. Socioeconomic impacts, such as property values impacts, only need to be considered in an EIS when they are caused by, or themselves cause, some physical change to the environment and not caused by the perception of risk. *See* 40 C.F.R. § 1508.14. As the GEIS explains, “only those [socioeconomic impacts] directly affecting the natural and built environment are carried forward to the decision to renew an operating license.” *See* GEIS at 4-99 (NYS00131B).

VII. ASSESSMENT OF PROPERTY VALUE-DRIVEN OFFSITE LAND USE IMPACTS

A. Qualitative Assessment of Property Value-Driven Offsite Land Use Impacts

Q74. As an initial matter, is it appropriate to equate property value impacts with offsite land use impacts?

A74. (DPC, GST) No. Although property values may influence land use, a number of factors other than property values impact land use. A more appropriate method to evaluate potential offsite land use impacts is to consider historic land use patterns, current land use regulations and zoning ordinances, tax rates and incentives, population growth trends, and pending and proposed development plans.

Q75. Are you aware of any evaluations of offsite land use impacts from Indian Point that consider these other factors?

A75. (DPC) Yes. The GEIS reflects a comprehensive approach to assessing land use impacts. As previously noted in response to Questions 37 and 41, the GEIS develops offsite land use impact predictors that have been incorporated into NRC guidance and Table B-1. In developing these predictors, the GEIS cast a wide net looking for potential drivers for land use changes and identifies only two such mechanisms—tax revenue and population changes. *See* GEIS at 4-108, C-34 to -35 (NYS00131F). Importantly, Indian Point is one of the sites studied in detail by the NRC Staff, and the assessment in the GEIS makes clear that the presence of IP2 and IP3 has not resulted in any significant adverse offsite land use impacts. More importantly for this proceeding, the presence of IP2 and IP3 will not result in significant adverse offsite land use impacts during the license renewal period. The GEIS site-specific assessment of IP2 and IP3 housing impacts is contrary to Dr. Sheppard’s assumptions about the existence of significance adverse property value impacts, as explained in response to Questions 43 and 44.

Q76. In assessing offsite land use and housing impacts during the license renewal period, is it appropriate to rely on the GEIS case study impact evaluations?

A76. (DPC) Yes. The GEIS provides an appropriate NRC-approved approach to addressing the precise issues of concern in this proceeding. *See* Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,474 (explaining that “[t]he review of a Category 2 issue may focus on the particular aspect of the issue that causes the Category 1 criteria not to be met” in the GEIS) (NYS000127). The Indian Point evaluations in the GEIS are directly relevant here. Thus, as long as any changed circumstances are properly accounted for—which, as discussed in response to Questions 84 and

88, is the case here—it is completely appropriate to rely on the GEIS case study to evaluate offsite land use impacts in this proceeding.

Q77. Please summarize the GEIS case study evaluation and findings for Indian Point in the area of offsite land use from construction.

A77. (DPC) Section C.4.4.5.1 of the GEIS summarizes the case study assessment of offsite land use impacts resulting from both the construction and operation of Indian Point. *See* GEIS at C-89 to -90 (NYS00131G). The GEIS assesses the historic impacts from both plant construction and operation to properly place any projected future impacts in context. As the GEIS points out, IP2 and IP3 are located on a 239-acre site on the Hudson River. GEIS at C-89 (NYS00131G). Indian Point Nuclear Generating Station Unit 1 (“IP1”) is also located on the site, between IP2 and IP3, but the extension of the IP1 license is not a part of the instant license renewal application.

Before the beginning of IP1 construction in 1956, the plant property was the site of an amusement park and much of the surrounding property was vacant. GEIS at C-89 (NYS00131G). IP1 had already begun operations before plans for IP2 and IP3 were even announced. *See* G. Smith, *Con Edison Atomic Power Plant in Westchester Goes “Critical,”* N.Y. Times, Aug. 3, 1962 (ENT000151); M. Folsom, *2d Atom Generator Planned by Con Ed,* N.Y. Times, Oct. 30, 1965 (ENT000152); P. Millones, *Con Ed Approves 3d Nuclear Unit at Indian Point,* N.Y. Times, Apr. 26, 1967 (ENT000153). Thus, prior to the completion of IP2 and IP3 construction, land in the immediate vicinity of the plant site was already zoned for heavy industrial use and some of it had been developed. GEIS at C-89 (NYS00131G).

As the GEIS explains, Indian Point construction had very minor direct land use impacts on property in the immediate vicinity of the site. GEIS at C-89 (NYS00131G). The former

amusement park site provided more than adequate land area for the three units and their associated buildings and storage facilities. GEIS at C-89 (NYS00131G).

The GEIS also finds IP2 and IP3 construction had positive land use impacts on the Village of Buchanan. *See* GEIS at C-89 (NYS00131G). Since the late nineteenth century, development along the Hudson River near Buchanan had been made up largely of river-oriented commercial land uses such as quarrying. GEIS at C-89 (NYS00131G). However, at the time Indian Point construction commenced, much of this commercial development had slowed to a halt. GEIS at C-89 (NYS00131G). Indian Point construction gave Buchanan the opportunity to develop industrial properties. GEIS at C-89 (NYS00131G). To help encourage such development, Buchanan rezoned much of its land along the river for industrial use for Indian Point construction, and similarly, some of the surrounding property was subsequently developed for other industrial uses. GEIS at C-90 (NYS00131G). This industrial growth included the Georgia-Pacific and Standard Brands facilities south and north of Indian Point, respectively. GEIS at C-90 (NYS00131G). This new development helped bolster Buchanan's economy and established the industrial land use pattern that has dominated development along the Hudson River in Buchanan since Indian Point's construction. GEIS at C-90 (NYS00131G).

Q78. Please summarize the GEIS case study evaluation and findings for Indian Point in the area of offsite land use from operations.

A78. (DPC) The GEIS finds that Indian Point operations had noticeable land use impacts in the immediate vicinity of the site, in the Town of Cortland and the Villages of Buchanan and Peekskill. GEIS at C-90 (NYS00131G). Although some individuals interviewed by the NRC Staff believed that Indian Point-related transformers and transmission lines may have deterred some residential development in Buchanan, others indicated that Indian Point's

local tax contributions allowed Cortlandt and Buchanan to maintain relatively low property tax rates and that this encouraged new residential development. *See* GEIS at C-90 (NYS00131G). In fact, the GEIS points out that some relatively-expensive homes were built within 1 mile of Indian Point. GEIS at C-90 (NYS00131G). Because residential growth has continued in Buchanan within a short distance of Indian Point, the GEIS finds that the overall land use impacts of the plant's presence seem to be neutral to positive in terms of residential development patterns. GEIS at C-90 (NYS00131G).

Indian Point and the industrial development that it helped spawn in the Village of Buchanan also helped encourage industrial development in the City of Peekskill. GEIS at C-90 (NYS00131G). North of Indian Point, Peekskill developed the Charles Point Industrial Park at an old Standard Brands complex. GEIS at C-90 (NYS00131G). The Charles Point complex (which is the site of the Charles Point Resource Recovery Plant, the county's waste disposal facility, now named Wheelabrator Westchester) has been very successful in attracting small industries. GEIS at C-90 (NYS00131G). The successful siting of the Indian Point facilities encouraged Buchanan and Peekskill to further promote industrial development around Indian Point and at Charles Point. GEIS at C-90 (NYS00131G). This development further established industry as the dominant land use along the Hudson River in Buchanan and Peekskill. GEIS at C-90 (NYS00131G). Thus, the GEIS concludes that historic Indian Point operations had a noticeable impact on the residential and industrial development patterns in Buchanan and Peekskill. GEIS at C-90 (NYS00131G).

Q79. Does this mean that license renewal offsite land use impacts are also significant?

A79. (DPC) No. Under NEPA, license renewal impacts must be judged based on the current baseline, which by definition includes the already-felt effects resulting from the historic Indian Point operations as well as the current, well-established land use patterns. *See Proposed Rule, Environmental Review for Renewal of Operating Licenses, 56 Fed. Reg. 47,016, 47,020 (Sept. 17, 1991) (NYS000125); CEQ Guidance on Consideration of Past Action in Cumulative Effects Analysis 1-2 (June 24, 2005) (ENT000146).* Thus, the GEIS only uses these historic impacts to provide context before separately evaluating land use impacts that may occur as a result of license renewal, given various other existing constraints, such as current land development and use patterns and zoning regulations.

Q80. Please summarize the GEIS case study evaluation and findings for Indian Point regarding offsite land use impacts from license renewal.

A80. (DPC) Section C.4.4.5.2 of the GEIS assesses the potential for offsite land use impacts resulting from IP2 and IP3 license renewal. *See GEIS at C-90 to -91 (NYS00131G).* The GEIS finds that direct Indian Point impacts on land use in the immediate vicinity of the site, in the Villages of Buchanan and Peekskill, and in Westchester County, are expected to be small. GEIS at C-90 (NYS00131G). Specifically, the GEIS concludes that population growth associated with the license renewal term is projected to account for less than 0.1 percent of Westchester County's projected population in 2013. GEIS at C-90 (NYS00131G). Increases this small during the license renewal term are likely to have no impact in terms of residential development patterns. GEIS at C-90 (NYS00131G).

In addition, the GEIS explains that because much of the land in the vicinity of Indian Point has been zoned for industrial use, and because the industrial land use pattern has become well-established along the river in the Village of Buchanan, it is expected that the area would continue to attract some industrial development. GEIS at C-90 to -91 (NYS00131G). As the GEIS indicates, this is especially true given that the Charles Point Industrial Park will likely continue to cater to smaller, light industries and warehouse operations. GEIS at C-91 (NYS00131G). Therefore, the GEIS finds that because the residential and industrial land use patterns that exist in the Village of Buchanan have been established for many years, and would likely continue for reasons independent of IP2 and IP3 license renewal, any new direct land use impacts from the IP2 and IP3 license renewal are expected to be small. GEIS at C-91 (NYS00131G).

The GEIS also finds that indirect land use impacts during the license renewal period from IP2 and IP3 would also be small. GEIS at C-91 (NYS00131G). In 1996, when the GEIS was written, IP2 was owned by ConEd, which paid taxes to local jurisdictions and was becoming an increasing source of tax revenue. *See* GEIS at C-85, C-199 (NYS00131G). At that time, IP3 was owned by the Power Authority of the State of New York (“PASNY” or “NYPA”), which had been making decreasing PILOT payments to local jurisdictions since 1993. GEIS at C-91 (NYS00131G). Due in part to the decrease in revenues from the then-in-place NYPA PILOT agreement, the GEIS finds that the Village of Buchanan and the Town of Cortlandt had to increase property tax rates, and key interviewees believed that this increase in property tax rates caused a decrease in the demand for residential development in these areas, which had an indirect land use impact. GEIS at C-91 (NYS00131G). Overall, however, the GEIS finds that

license renewal would have small direct and indirect land use impacts. GEIS at C-91 (NYS00131G).

Q81. Please summarize the GEIS case study evaluation and findings for Indian Point regarding housing impacts from construction and operations.

A81. (DPC) Section C.4.4.2.1 of the GEIS assesses the housing impacts resulting from construction and operation of IP2 and IP3. *See* GEIS at C-83 to -84 (NYS00131G). This GEIS assessment of the historic impacts from plant construction and operation was performed to properly place any projected future housing impacts associated with license renewal in context.

The GEIS finds that IP2 and IP3 construction had no noticeable impact on the local housing market or on housing values. *See* GEIS at C-83 (NYS00131G). Despite the peak size of the IP2 and IP3 workforce (2,400 workers in the early 1970s), very little in-migration was necessary because of the large size of the labor pool within reasonable commuting time in the local area and New York City. GEIS at C-83 (NYS00131G). The GEIS calculates that the total project-related housing demand created by direct migration and indirect job creation was less than 1 percent of the total number of year-round housing units in Dutchess and Westchester Counties. *See* GEIS at C-83 (NYS00131G). Further, IP2 and IP3-related demand made up only a small fraction of the vacant units in those counties. GEIS at C-83 (NYS00131G). Given that project-related demand made up a small portion of the local housing markets, the GEIS concludes that there was no discernable change in the housing market or in housing values. GEIS at C-83 (NYS00131G).

The GEIS also finds that operation of IP2 and IP3 has had no significant housing impacts. *See* GEIS at C-83 to -84 (NYS00131G). As the GEIS reports, most local planners and realtors interviewed by the NRC Staff indicated that Indian Point operations has not inhibited residential

growth in neighboring communities. GEIS at C-83 (NYS00131G). Instead, the prevailing view is that low property taxes and the good school district encouraged residential development and allowed for the quick sale of existing houses on the market. GEIS at C-83 (NYS00131G). The GEIS also finds that local residents express no reluctance about living near the plants, but that occasionally an outside buyer is deterred from the area because of the Indian Point facilities. GEIS at C-83 (NYS00131G). Despite this aversion on the part of the occasional buyer, the GEIS finds that there are always other buyers for housing properties near the site, so the housing market has not slowed. GEIS at C-83 (NYS00131G).

The GEIS also indicates that local realtors generally agree that housing values in communities neighboring the plant have not been depressed because of the presence of Indian Point. GEIS at C-83 (NYS00131G). Specifically, the GEIS finds that homes in the immediate area are moderately priced and sell very fast. GEIS at C-83 to -84 (NYS00131G). Overall, based in this information, the GEIS finds that IP2 and IP3 construction and operations did not significantly impact housing in the communities neighboring the plants. GEIS at C-84 (NYS00131G).

Q82. Please summarize the GEIS case study evaluation and findings for Indian Point in the area of housing impacts from license renewal.

A82. (DPC) Section C.4.4.2.2 of the GEIS assesses the potential for housing impacts resulting from IP2 and IP3 license renewal. *See* GEIS at C-84 to -85 (NYS00131G). The GEIS examines trends in housing growth in Westchester and Dutchess Counties, and finds growth rates suggesting that there will be sufficient housing available in the area to accommodate any increases in the workforce during the license renewal period. *See* GEIS at C-84. Thus, the GEIS

concludes that housing value and marketability impacts that would occur during the license renewal term are the same as those currently experienced. GEIS at C-85 (NYS00131G).

Q83. Is the GEIS evaluation of offsite land use and housing impacts from continued operations during the license renewal term consistent with the findings and conclusions in the FSEIS?

A83. (DPC) Yes. Although some offsite land use changes have taken place in the areas around Indian Point since the publication of the GEIS, these changes do not significantly alter the assessment of likely impacts from license renewal and, more specifically, do not undermine the conclusion that offsite land use impacts during license renewal are small.

Q84. Please explain what “changes” have taken place since the publication of the GEIS.

A84. (DPC) Since the 1990s when the GEIS was published, Westchester County has experienced relatively low population growth and limited land use changes—neither of which was directly related to the presence of Indian Point. ER at 4-42 (ENT00015B). Further, because Entergy does not anticipate that additional workers will be employed at the site during the license renewal period, there will be no adverse impact resulting from population driven land use changes associated with license renewal. *See* FSEIS at 4-46 (NYS00133B). Therefore, consistent with the GEIS, the FSEIS finds there would be no population-related land use impacts during the license renewal term beyond those currently experienced. FSEIS at 4-46 (NYS00133B).

Furthermore, population levels and land use conditions in the Town of Cortlandt, Village of Buchanan, and Westchester County have not changed significantly since Entergy started making payments to local jurisdictions. *See* FSEIS at 4-46 (NYS00133B). Based on the GEIS

assessment, this lack of offsite impacts from tax-driven offsite land use changes was unsurprising because the area around the site has pre-established land use development patterns that are anticipated to continue during the license renewal term, and existing public services and regulatory controls support and guide land use and development consistent with previously existing patterns. *See* ER at 4-42 (NYS00133B); GEIS at C-91 (NYS00131G). Therefore, consistent with the GEIS, the FSEIS finds there would be no tax-driven land use impacts during the license renewal term beyond those already being experienced. FSEIS at 4-46 to 4-47 (NYS00133B).

Q85. Based on the GEIS evaluations, what, if any, conclusions are you able to draw about the potential for property value-driven offsite land use impacts from IP2 and IP3 license renewal and for the no-action alternative?

A85. (DPC) The extensive, Indian Point-specific evaluation included in the GEIS finds no evidence of historic adverse property value impacts. *See* GEIS at C-83 to -85 (NYS00131G). The GEIS further suggests that any property value impacts that would occur during the license renewal term would be the same as those being experienced currently; *i.e.*, they would be non-detectable or minor. Further, both the GEIS case study and more recent information included in the ER and FSEIS all demonstrate that the IP2 and IP3 non-property value-driven offsite land use impacts are SMALL because pre-established land use development patterns are anticipated to continue during the license renewal term, and public services and regulatory controls are in place to support and guide land use and development. For these same reasons, offsite land use changes under the no-action alternative are also unlikely to be significant.

Q86. Does the potential for significant future property value changes under the no-action alternative, as asserted by NYS, affect your conclusion?

A86. (DPC, GST) No. First, we should emphasize that such property value changes are unlikely. This conclusion is supported not only by the preceding qualitative assessment based primarily on the Indian Point GEIS case study, but also by the evaluation presented by Dr. Tolley in Sections VII.B and VIII of this testimony.

Second, even if property values did change as a result of no-action, for the property value changes to result in significant changes to offsite land use, a number of intervening steps would be necessary. These steps would include significant alterations to the current industrial land use pattern that has dominated development along the Hudson River in Buchanan for decades. However, because the industrial land use pattern is well-established, and local regulatory controls are in place to guide land use development, there is no reason to believe that denial of the IP2 and IP3 license renewal application could cause such significant changes. GEIS at C-90 to -91 (NYS00131G). Thus, even assuming for the sake of argument that property values would increase as a result of the no-action alternative, there would be no subsequent significant land use changes.

Q87. What would need to happen for there to be significant changes to the current industrial land use pattern along the Hudson River in Buchanan?

A87. (DPC) For significant offsite land use changes to occur, numerous uncertain future steps would have to take place, including zoning changes, shutting down other nearby industrial facilities along the Hudson River (*e.g.*, the LaFarge wallboard factory to the south and the county's waste disposal facility to the north), and then developing the surrounding properties.

Q88. Are these types of changes anticipated in the future?

A88. (DPC) No. The current master land use plans from the Village of Buchanan, the Town of Cortlandt, City of Peekskill, and Westchester County support the view that such long-term, future changes are speculative. *See* Village of Buchanan, Comprehensive Master Plan (Mar. 2005) (ENT000137); Town of Cortlandt, Comprehensive Master Plan (July 2004) (ENT000138); Westchester County, Context for County and Municipal Planning in Westchester County and Policies to Guide County Planning (Jan. 2010) (ENT000139). These plans anticipate only minor long-term shorefront zoning changes. Most of the shorefront will continue to be zoned industrial and light industrial with enhancement of green spaces, parks and in Cortlandt, enhanced waterfront tourism. Similarly, at the time of complete decommissioning (whenever that may be), Buchanan currently intends to zone the small wooded area on the Indian Point site as green-space, but the remainder of the site will remain zoned industrial. Village of Buchanan, Comprehensive Master Plan at IIB-11 (Mar. 2005) (ENT000137).

Q89. Could you evaluate the impacts of hypothetical significant land use changes?

A89. (DPC) Such an evaluation would amount to pure speculation because there are no details (and NYS has provided none) about what type of specific new development would take place due to IP2 and IP3 ceasing operations, making it essentially impossible to assess whether any hypothetical subsequent future changes would have small, moderate, or large impacts based on the definitions in the GEIS. *See* GEIS at 4-107 to -108 (NYS00131B). Similarly, because the same land use changes may be perceived by some community members as adverse and by others as beneficial, it is impossible to characterize such changes as positive or negative. *See* GEIS at 4-109 (NYS00131B). Assessing such potential land use changes is made all the more impractical given that such changes might not occur until some unspecified future time after

Indian Point is decommissioned. Given the speculative nature of making such assumptions about future land use changes many decades from now, the FSEIS appropriately concludes that offsite land use changes would not be significant, declining to hypothesize about possible economic impacts of unlikely future land use changes resulting from yet-uncertain steps by unknown third parties.

B. Economic Assessment of Property Value-Driven Offsite Land Use Impacts

Q90. Assuming offsite land use could be directly and significantly influenced by property values and one wanted to predict what that effect would be, would it be important as a first step to properly estimate the change in property value?

A90. (GST) Yes. To even begin the analysis of reasoning from property value change to estimating offsite land use effects, one would have to begin with a reasonable prediction on the likely property value change.

Q91. Is there a scientifically-accepted method to estimate the impact of a nuclear power plant on surrounding property values?

A91. (GST) Yes. The accepted method for determining property value impacts involves hedonic price modeling. Hedonic pricing models are widely used by economists and others concerned with real estate values to assess the impacts of house and community characteristics on property values.

Q92. Can you explain what hedonic pricing is?

A92. (GST) Yes. The price of a home depends on many characteristics of the individual property such as the number of rooms, total square footage, lot size, and proximity to amenities (such as parks and high-quality schools) or remoteness of disamenities (such as noisy freeways or polluting facilities). Hedonic pricing takes advantage of this fact and, using statistical regression, allows researchers to estimate the effect of a single attribute on the sale

prices of homes while controlling for the other characteristics that affect property values. *See* A. Boardman, D. Greenberg, A. Vining, and D. Weimer, *Cost-Benefit Analysis: Concepts and Practice* at 348-352 (3d ed. 2006) (ENT000154). Using such an approach and controlling for these other variables, one would expect to find an increase in property values with increasing distance from a nuclear plant if there was in fact an adverse property value impact.

Q93. Are there any limitations to using hedonic pricing models?

A93. (GST) Because hedonic pricing is based on statistical regression analysis, a statistically-significant correlation between the dependent variable and an explanatory variable does not necessarily imply that the model reflects a causation pattern. *See, e.g.*, Tolley Report at 14 (ENT000144). For example, the location of nuclear plants is not random. The sites that utility companies select for plants may be, in part, a response to the pre-existing property values in particular areas rather than the opposite (*i.e.*, that property values are affected by the presence of the plant). Another important consideration is that the regression coefficient for a particular site or time period cannot be used to directly predict outcomes for other sites or time periods. Finally, unobserved or omitted variables have a large potential influence in hedonic pricing analysis. *See* Tolley Report at 13 (ENT000144). Unobserved variables can include, for example, distance effects of attractive and unattractive sites not considered.

Nonetheless, hedonic regression analysis is the most reliable tool available for estimating the impacts of power plants on property values. It has been widely-used to study impacts from power plants and other types of facilities that may pose actual or perceived risks. *See, e.g.*, D. Clark, L. Michelbrink, T. Allison, and W. Metz, *Nuclear Power Plants and Residential Housing Prices*, 28 *Growth & Change* 496 (Fall 1997) (NYS000236); H. Gamble and R. Downing, *Effects of Nuclear Power Plants on Residential Property Values*, 22 *J. of Regional Sci.* 457

(1982); G. Blomquist, *The Effect of Electric Utility Power Plant Location on Area Property Value*, 50 Land Econ. 97 (Feb. 1974) (NYS000234). Based on this extensive literature, hedonic modeling has been and can be used to identify relatively large property values impacts. See A. Boardman, D. Greenberg, A. Vining, and D. Weimer, *Cost-Benefit Analysis: Concepts and Practice* at 348-352 (3d ed. 2006) (ENT000154). Although smaller impacts, particularly those that are small enough to be offset by positive impacts also associated with a facility, may be difficult to detect using hedonic modeling, no other methodology provides a more reliable means to identify such minor or insignificant effects.

Q94. If a property value impact is observed using hedonic pricing modeling, does that necessarily mean the impact is related to the physical environment?

A94. (GST) No. Such a finding would not necessarily mean that the property value impact is the result of a physical change to the environment. As I mentioned, hedonic modeling is based on statistical regression. Sound judgment must be used before using the results to support a particular causation theory. Thus, even if one found the presence of nuclear power plant was correlated with a property value impact, one would need to exercise care in interpreting the results and before reaching any conclusions about what aspect of the nuclear plant, if any, specifically caused the property value impact. Economists readily acknowledge that real estate preferences may be shaped by factors completely unrelated to physical environmental impacts. Simply put, some people may not like living near certain types of facilities regardless of anything having to do with physical changes to the environment. In fact, as discussed later in my testimony, an explanation frequently cited in published, peer-reviewed journal articles by economic researchers for potential nuclear power plant property value impacts is public perception of risk and fear of nuclear power.

Q95. You mentioned previous published studies involving nuclear power plants and property values. Please describe these studies.

A95. (GST) There have been a number of published, peer-reviewed hedonic site-specific studies of the effects of nuclear power generation facilities on property values, which are summarized in more detail in Section 1 of my report entitled, “Property Value Effects of Indian Point License Renewal” (ENT000144). I will briefly highlight the findings from the most important and relevant studies.

The most extensive previous analyses available on the effects of proximity to a nuclear plant on property values involved a series of studies published in the 1990s involving two nuclear power plants in California: Diablo Canyon and Rancho Seco. See D. Clark, L. Michelbrink, T. Allison, and W. Metz, *Nuclear Power Plants and Residential Housing Prices*, 28 *Growth & Change* 496 (Fall 1997) (NYS000236); W. Metz and D. Clark, *The Effect of Decisions About Spent Nuclear Fuel Storage on Residential Property Values*, 17 *Risk Analysis* 571 (Oct. 1997) (ENT000155); D. Clark and T. Allison, *Spent Nuclear Fuel and Residential Property Values: The Influence of Proximity, Visual Cues, and Public Information*, 78 *Papers in Regional Sci.* 403 (Oct. 1999) (ENT000156). In these studies, researchers used large samples of properties to develop statistical regression equations in which property value information was regressed based on the distance of each property from the nuclear plant and other variables. These other variables included proximity to other attractive and unattractive sites, commuting time of the resident, and the political jurisdiction within which the property was located. The studies differed in the data sets used and in details of the regression specifications. The weight of the evidence from the Rancho Seco and Diablo Canyon studies indicated that there is no

reliable basis for concluding that proximity to a nuclear plant depresses property values. *See* Tolley Report at 11 (ENT000144).

In addition, an article by Hays Gamble and Roger Downing, entitled “Effects of Nuclear Power Plants on Residential Property Values” (1982) (ENT000145) presented results of two other studies. The full details of these studies are also contained in two NRC published reports that Mr. Cleary mentioned earlier. *See* NUREG/CR-2063, *Effects of the Accident at Three Mile Island on Residential Property Values and Sales* (Apr. 1981) (ENT000134); NUREG/CR-0454, *Effects of Nuclear Power Plants on Community Growth and Residential Property Values* (Nov. 1978) (ENT000135).

In one study, Gamble and Downing estimated the effect of proximity to the TMI plant before and after the accident on the sales prices of single family homes within a 25-mile radius of the facility. H. Gamble and R. Downing, *Effects of Nuclear Power Plants on Residential Property Values*, 22 *J. of Regional Sci.* 457 (1982) (ENT000145). The study found evidence of a positive relationship between distance from TMI and home sales price, suggesting that the plant had a small negative impact on residential housing prices. However, the authors believe that this result is unreliable, and captured an unmeasured gradient of land values that pre-dated the construction of the plant. The lower value of the housing stock in communities close to the plant was confirmed in pre-construction housing data from 1966 presented by the authors. Thus, the study found no evidence that TMI construction and operations, or the accident, had adverse effects on property values. Gamble and Downing, *Effects of Nuclear Power Plants on Residential Property Values* at 476 (ENT000145).

The second study discussed in Gamble and Downing examined the effects on home sale prices of four nuclear plants in the U.S. Northeast: Pilgrim near Plymouth, MA; Millstone, near

Waterford, CT; Oyster Creek in Lacy Township, NJ; and R.E. Ginna near Rochester, NY. Sales records were collected for a total of 540 single family homes in residential developments with a high degree of homogeneity within 20 miles of one of the four nuclear plants, and the authors controlled for structural characteristics of homes sold, proximity to major employment sites, and proximity to other attractive sites. Gamble and Downing, *Effects of Nuclear Power Plants on Residential Property Values* at 461 (ENT000145). In their pooled analysis, the authors found the effect of visibility of a plant from the property was positive and statistically significant, *i.e.*, it suggested that being able to see the plant correlated to higher, not lower, property values. This impact is not expected and the authors believe the implied relationship between plant visibility and sales price of the property is unreliable, capturing instead the amenity of waterfront or near-waterfront property also associated with those homes in the study able to see the plant. Distance to the plant was also measured and included in the regression. While the coefficient was negative, indicating that proximity to a nuclear power plant is a desirable local amenity, it was not statistically significant. Therefore, the study concluded that these nuclear power plants had no adverse effect on residential property values. Gamble and Downing, *Effects of Nuclear Power Plants on Residential Property Values* at 476 (ENT000145).

In my opinion, these studies, which focused on a reasonable geographic area around specific nuclear power plants, are the most relevant and applicable for assessing the likelihood for property value impacts from Indian Point. The weight of the evidence from these studies indicates that there is no reliable basis for concluding that proximity to nuclear power plants causes lower property values.

Q96. Are there any published hedonic-based studies that you would not use to assess the likelihood for property value impacts from Indian Point?

A96. (GST) Yes. Several national sample studies provide minimal to no insight regarding the effects of power plants on property values near Indian Point. In 1994, Clark and Nieves published a study of the influence of eight types of facilities, including nuclear power plants, coal-fired plants, gas-fired and oil-fired plants, chemical weapon storage facilities, and hazardous waste facilities. See D. Clark and L. Nieves, *An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values*, J. of Env't'l Econ. & Mgmt., Vol. 27 (Nov. 1994) (NYS000235). As an initial matter, the findings were inconsistent. For example, chemical weapon storage facilities and hazardous waste facilities were found to have positive impacts on property values. This apparent inconsistency strongly suggests that important variables were omitted or that incorrect assumptions were used.

Furthermore, the study used the 1980 Census Public Use Microdata Sample to obtain individual level self-reported characteristics of 45,899 housing units in 76 Census Study Areas. D. Clark and L. Nieves, *An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values* at 235 (NYS000235). The only location information is an indicator (dummy variable) for observation presence within or not within the central city of a Standard Metropolitan Statistical Area ("SMSA"). D. Clark and L. Nieves, *An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values* at 244 (NYS000235). The authors were therefore unable to calculate the distance between each observation and the facilities in their study.

Without access to specific geographic information for the observations in the sample, Clark and Nieves could not control for small-area influences on housing values. For example,

the presence of nuclear power generating facilities was measured as a variable indicating whether or not a facility existed (or had been planned) by 1980 within 1,000 miles of the SMSA of the observation. Clark and Nieves, *An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values* at 244 (NYS000235). Any effect of undesirable facilities on housing values was a common effect over study areas ranging from 22 to 7,218 square miles, with an average area of approximately 1,500 square miles.

Q97. Why would you not use the Clark and Nieves study to assess the likelihood for property value impacts from Indian Point?

A97. (GST) It is widely understood by economists that the potential influence of unobserved variables in statistical housing analysis is large. Unobserved variables could include distance effects of attractive and unattractive sites not considered. The potential for contamination of results by unobserved variables is increased by the use of wide geographic areas where details on numerous amenities and disamenities, including the specific characteristics of undesirable facilities, cannot feasibly be included. For example, coal-fired power plants can vary in a number of ways relevant for property value impacts, including the size and age of the plant, its location within an area, and if any pollution abatement equipment is installed.

Causality is another problem. The location of nuclear plants is not random, and the selection of the sites of plants by utility companies may be in part a response to the land values in particular areas. Clark and Nieves assume the opposite, that land values are affected by the presence of the plant.

The lack of applicability of the Clark and Nieves study to areas directly surrounding nuclear plants in a local setting, as well as omitted variable problems and problems of

interpretation of causality, preclude its use to determine whether Indian Point causes property value impacts.

Thus, in this case, it would be inappropriate to use Clark and Nieves, or similar studies (e.g., Sherman Folland and Robbin Hough, *Externalities of Nuclear Power Plants*, 40 J. of Regional Sci. 735, 749 (2000) (NYS000233)) to estimate the potential for Indian Point property value impacts. Being aggregative, the results of such studies are particularly susceptible to omitted variable bias and problems of causality, and they do not contain information needed to estimate effects of an individual plant in a local setting.

Q98. Based on your review of the literature on nuclear power plants, do you have an opinion on the likelihood that Indian Point currently adversely impacts nearby property values?

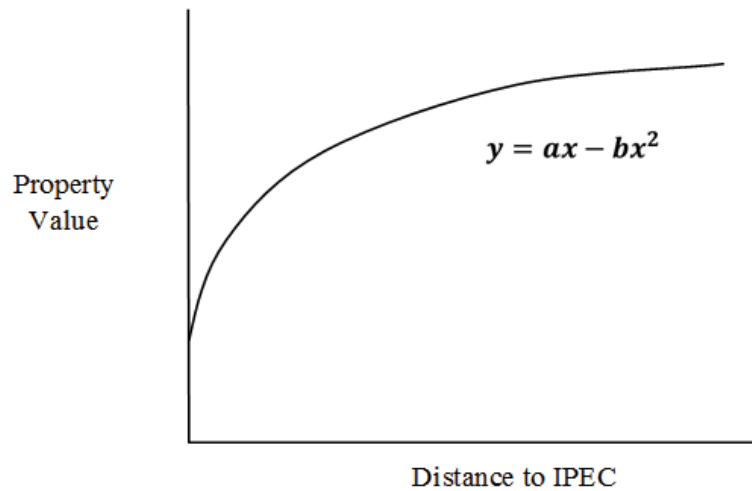
A98. (GST) I do. Based on my literature review, it is unlikely that Indian Point currently has any significant adverse impact on property values because the most comprehensive and applicable previous studies find that nuclear power plants have no significant negative impacts on residential property values.

Q99. Have you performed an Indian Point-specific assessment to determine whether Indian Point does in fact currently have a significant adverse impact on property values?

A99. (GST) Yes. For purposes of this proceeding, I conducted an original econometric study to determine the potential for current impacts on property values from Indian Point. My study used a hedonic pricing model, and the methodology and results are presented in Section 2 of my report entitled, "Property Value Effects of Indian Point License Renewal" (ENT000144).

As I previously stated, hedonic price modeling is the most reliable method to identify the potential for property value impacts due to the presence of Indian Point.

If Indian Point were a disamenity or nuisance that has an adverse property value impact, as NYS alleges, then proximity to Indian Point would depress property values. One would thus expect that: (1) property values would increase moving away from the plant; and (2) this negative impact would be lessened farther away from the plant and eventually, at some maximum distance, there would no longer be a negative impact. Figure 1 of my report (ENT000144) shows this hypothesized relationship and is represented below. The formula $y=ax-bx^2$ shown in the figure illustrates the general shape of the relationship. The coefficient “a” multiplying distance x illustrates the first effect of property values increasing as one goes farther away from the plant due to the lessening of the reduced proximity to the plant. The coefficient “-b” multiplying distance squared x^2 , illustrates the second effect of the lessening of the negative impact of an increase in distance the farther away that properties are from the plant. The positive coefficient of x and the negative coefficient of x^2 indicate the signs expected on the coefficients of these variable in a hedonic regression analysis if the hypothesis is true.

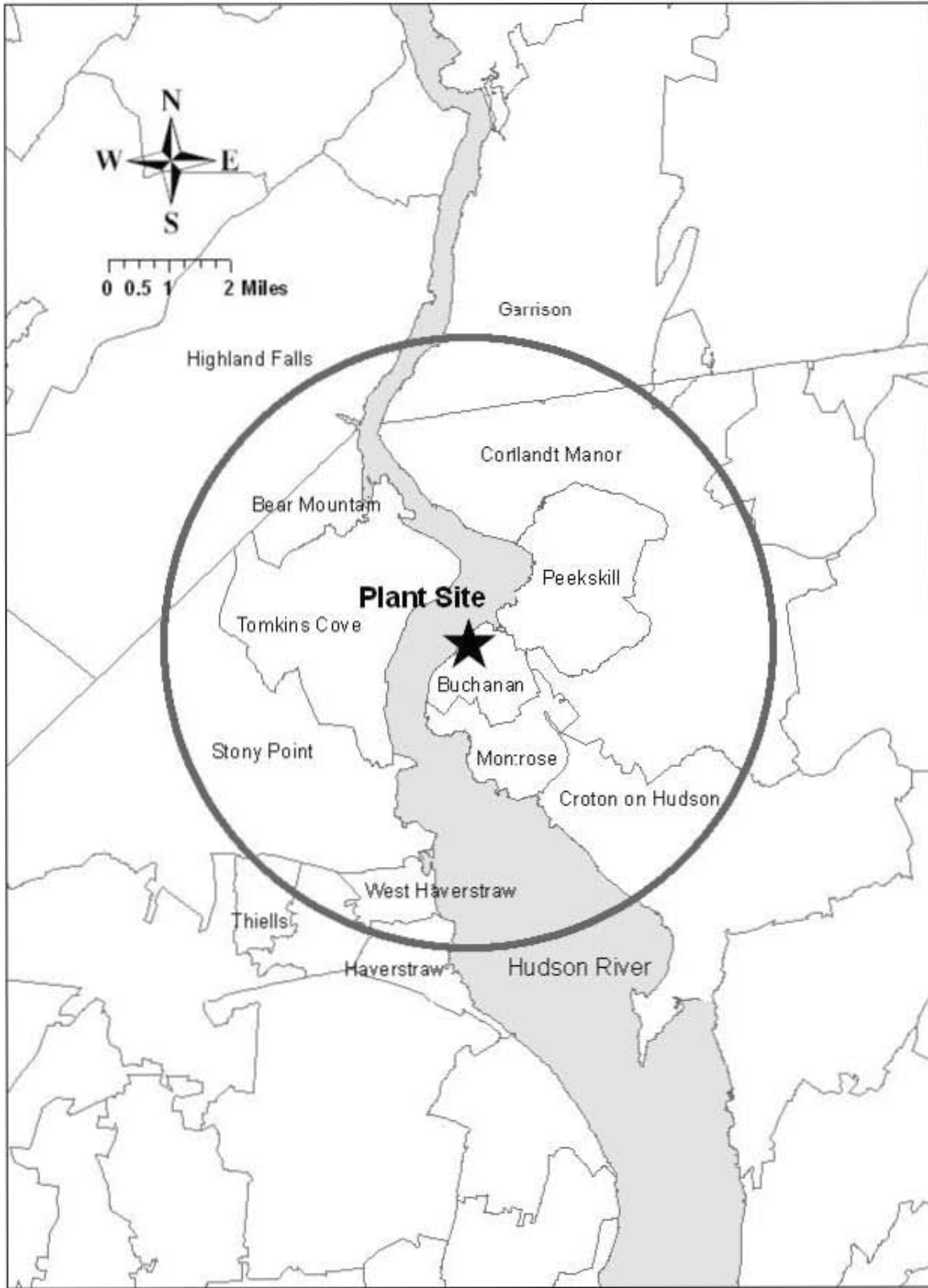


Source: Tolley Report at 20 (ENT000144).

By controlling for variables widely-recognized to influence property values, I was able to test this hypothesis and determine whether Indian Point currently adversely impacts property values.

Q100. Please describe your methodology to test whether Indian Point adversely impacts property values.

A100. (GST) To examine the relationship between Indian Point and current, nearby property values, I collected data from the Multiple Listing Service (“MLS”). The dataset was collected on July 13, 2011, and includes residential properties actively listed for sale on that date in zip codes falling in a 5-mile radius of Indian Point. Map 1 in my report (ENT000144) shows the area examined, including the names of the affected towns and is reproduced below:



Source: Tolley Report at 16 (ENT000144).

Q101. Did you screen or exclude any data from the sample prior to the analysis?

A101. (GST) Yes. I screened the data to identify obvious errors, unverifiable records, and other anomalies. Properties with dwellings older than 75 years were excluded from the sample because the relationship between house age and price breaks down at a certain point due to heterogeneity in the quality of dwellings, which would have made it more difficult to identify any adverse Indian Point property impacts. Tolley Report at 15 n.8 (ENT000144). Excluding such homes allowed for final statistical analysis of 296 observations. Tolley Report at 15 (ENT000144).

Q102. Please describe the analysis of the final sample.

A102. (GST) I matched observations in this final sample with data from the 2000 U.S. Census based on the Census Block Group ID and spatial variables (*e.g.*, distance from the site and commuter rail stations). Tolley Report at 15 (ENT000144). I created these spatial variables using the U.S. Census Shape files in the ArcGIS program, a standard and widely-used geographic information system program. Tolley Report at 15 (ENT000144). I then recorded individual property characteristics for all listings. In addition, I generated a variable measuring the estimated per-household PILOT payments using data on anticipated payments in 2011 to examine the impact of Entergy's PILOT payments on home prices. Tolley Report at 15 (ENT000144).

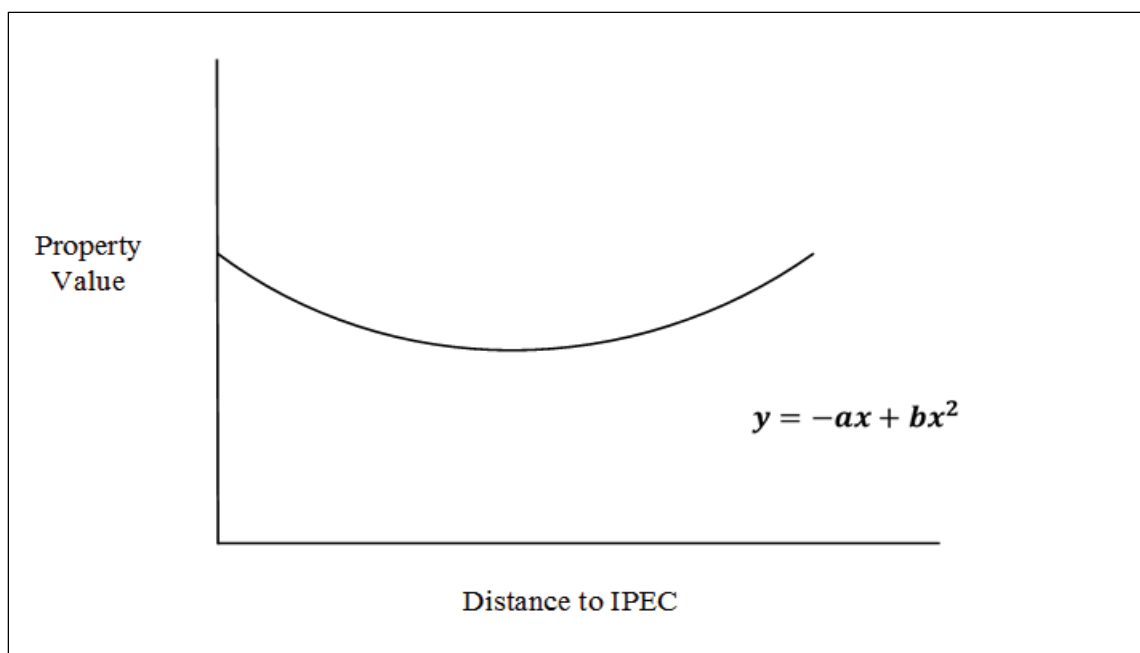
Using this dataset, I ran statistical regressions using STATA v9.2, a general-purpose statistical software package widely-used in economics and other research fields, to estimate the relationship between the asking price and a set of seven variables: distance to Indian Point, distance to Indian Point squared, median income, the age of the house, whether it was a

condominium or townhome, the distance to nearest commuter rail station, and the estimated per-household 2011 PILOT payment. Tolley Report at 17 (ENT000144).

Q103. Please describe the results of your Indian Point-specific property value impact assessment.

A103. (GST) The full regression results are reported in Table 1 of my report. Tolley Report at 17 (ENT000144). The results are clear—proximity to the Indian Point site is not a disamenity and thus, Indian Point does not adversely impact property values. In fact, the Distance to IPEC coefficient is not statistically significant and the relationship is exactly the opposite of what one would expect if Indian Point were a disamenity or nuisance. In other words, the Distance to IPEC coefficient is negative and suggests that there is a linear negative effect of distance moving away from the plant; *i.e.*, property values are lower the farther the property is from the plant. Tolley Report at 20-23 (ENT000144). Because the Distance to IPEC coefficient does not match the pattern expected if Indian Point caused adverse property value impacts, these results do not support the NYS hypothesis that Indian Point is a disamenity.

Furthermore, because the coefficient of Distance to IPEC Squared is positive, the amenity initially decreases the farther away the property is from the plant. Tolley Report at 21 (ENT000144). This coefficient further suggests distance to Indian Point remains an amenity up to 1.99 miles from the plant, but that at greater distances, the plant becomes a disamenity and, in fact, the disamenity effect increases the farther the property is from the plant. Tolley Report at 21 (ENT000144). This anomalous result is represented in Figure 2 of my report (ENT000144), which is the contrary to what one would expect if Indian Point actually depressed property values.



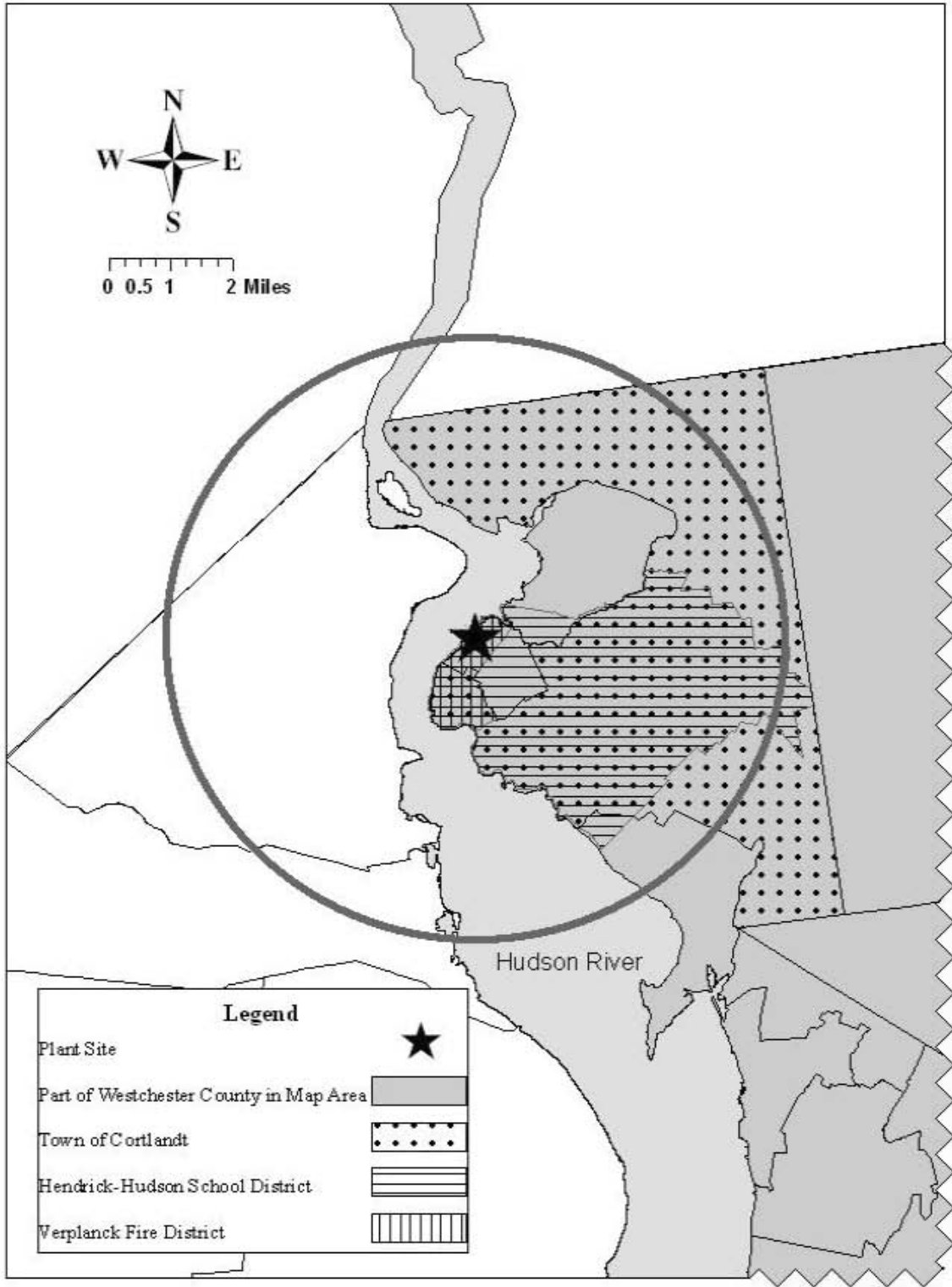
Source: Tolley Report at 21 (ENT000144).

Q104. What does this anomaly suggest?

A104. (GST) The anomalous Distance to IPEC and Distance to IPEC Squared relationship suggests the presence of an unobserved variable, but there is a complete lack of evidence that would suggest such a variable is masking a large significant adverse Indian Point property value impact.

Q105. Please describe the results for the PILOT Payments variable.

A105. (GST) The PILOT Payments variable is an estimate of the per-household value of payments by Entergy to four taxing districts in 2011. A given property in the MLS sample may fall within one or more districts receiving payments, or within none of the districts, based on the location of the property, as shown in Map 2 of my report (ENT000144):



Source: Tolley Report at 19 (ENT000144).

The PILOT coefficient in the regression is of the expected sign (*i.e.*, higher per-household payments from Entergy are associated with higher the property values). While it is not statistically significant, it supports the pattern of reasonable coefficients in the regression. *See* Tolley Report at 17 (ENT000144).

Q106. Please describe the results for the other variables.

A106. (GST) The other variables (*i.e.*, the coefficients of Median Income, House Age, the variable indicating whether a home is a Condo/Townhome, and Distance to the Nearest Commuter Rail Station) all are of expected sign and highly statistically significant. For example, people are willing to pay more to live in a newer home, in a free-standing home (compared to a condominium or townhome), and to live closer to a commuter rail station. *See* Tolley Report at 17 (ENT000144).

Q107. Based on your Indian Point-specific property value impact assessment, what, if any, conclusions are you able to draw about the existence of property value-driven offsite land use impacts due to the presence of IP2 and IP3?

A107. (GST) Overall, my hedonic regression results are both reliable and reasonable. Based on these results, I conclude that proximity to the Indian Point site has no discernible adverse impact on residential property values. This conclusion is the same as peer-reviewed studies at other nuclear plants that I discussed previously. Given the lack of discernible adverse property value effects of proximity to the site, the estimate is that removal of the proximity effect under the no-action alternative would not cause property value-driven offsite land use impacts.

VIII. RESPONSE TO ISSUES RAISED IN CONTENTION NYS-17B

A. General Rebuttal to Dr. Sheppard's Reports

Q108. Please describe the basis for NYS's assessment of offsite land use impacts under the no-action alternative.

A108. (DPC, GST) NYS provides essentially no site-specific analysis of whether the no-action alternative will have any offsite land use impacts. Dr. Sheppard claims alleged current adverse property value impacts associated with the presence of Indian Point would disappear following the no-action alternative. *See* 2007 Sheppard Report at 2 (NYS000226). He then simply assumes these asserted property value impacts cause land use impacts. *See* 2007 Sheppard Report at 2 (NYS000226). In this regard, Dr. Sheppard indicates that any "external factor" that lowers property values also alters incentives to develop the land and thus alters land use. *See* Sheppard Testimony at 8 (NYSR00224). As Dr. Sheppard states in his original 2007 Report: "If the presence of the nuclear power generating plant has a significant impact on property values, then it logically follows that extending the license will have a significant impact on property values which in turn will affect land use by affecting the decisions made by thousands of property owners and developers." 2007 Sheppard Report at 2 (NYS000226). Thus, Dr. Sheppard simply equates land use impacts with his postulated property value impacts without evidentiary support. *See* 2007 Sheppard Report at 2 (NYS000226).

Further, although he vaguely references "external factors" and "nuisance and disamenity," it is unclear what particular attribute of Indian Point Dr. Sheppard believes is causing these alleged lower property values. Sheppard Testimony at 8 (NYSR00224); 2010 Sheppard Report at 2 (NYS000228). The only place NYS provides any explicit indication of the potential for physical environmental impacts to effect property values is in the NYS Summary Disposition Response. *See* NYS Summary Disposition Response at 7-8 (claiming that the "direct

effects are substantial” because “Indian Point can be seen from Hudson River and Village of Buchanan,” the “superheater stack for IP1; and IP2 and IP3 buildings; and IP reactor containment structures ‘dominate the local landscape and can be seen from the Hudson River;’” “noise from units is ‘detectable off site,’” and that “tritium, strontium, cesium and nickel, are leaking into groundwater and reaching Hudson River”) (citations omitted). Dr. Sheppard, however, does not cite or otherwise appear to rely on such information in his current testimony. Instead, as discussed in more detail later in response to Question 111, Dr. Sheppard cites prior hedonic studies involving nuclear power plants, which suggest that any impacts on property values from the presence of nuclear power plants is the result of risk and public aversion to nuclear power rather than any physical impacts to the environment.

Q109. Do you agree with Dr. Sheppard that property value changes necessarily have offsite land use impacts?

A109. (DPC, GST) No. As we previously explained in response to Question 74, a potential impact to property values is not the same thing as an offsite land use impact. Although property values may influence land use, a number of factors other than property values impact land use. Dr. Sheppard does not recognize that offsite land use is heavily influenced by historic land use patterns, current land use regulations and zoning ordinances, tax rates and incentives, population trends, and pending and proposed development plans. Instead, Dr. Sheppard simply assumes that sometime following the cessation of IP2 and IP3 operations, the site and adjacent properties would be put to their “highest and best alternative use,” which would involve “a combination of attractive riverfront development that would be likely to include employment and other attractive locations.” 2007 Sheppard Report at 3 (NYS000226).

Q110. How does NYS assess property value impacts in NYS-17B and its predecessors?

A110. (GST) NYS submitted five reports by Dr. Sheppard prepared between 2007 and 2011. In these reports, Dr. Sheppard continually revises his arguments and theories, changing assumptions and even methodologies, yet rarely explains his changes or whether they alter his earlier filings and conclusions. The major arguments drawn from these reports are described and addressed more fully later in this testimony. Briefly:

- The 2007 Sheppard Report (NYS000226), the first report, applies the findings of a 1974 hedonic study involving an Illinois coal plant to estimate the alleged current Indian Point property value impact.
- The 2009 Sheppard Report (NYS000227) relies on the property value impact estimated in the 2007 Sheppard Report to compare various license renewal and no-action alternative decommissioning scenarios. The 2009 report assumes a 10-year decommissioning period in the no-action case. 2009 Sheppard Report at 2 (NYS000227). In the license renewal case, Dr. Sheppard assumes a range of decommissioning periods of between 60 and 140 years, but does not specify a definite date. *See* 2009 Sheppard Report at 3-5 (NYS000227).
- The 2010 Sheppard Report (NYS000228) contains a general discussion of property value determinants, but does not calculate any property value impacts.
- The January 2011 Sheppard Report (NYS00030) is similar to the 2009 Report in that Dr. Sheppard relies on the 2007 Sheppard Report's estimated property value to compare various license renewal and no-action alternative decommissioning scenarios. This time, however, Dr. Sheppard assumes a 32-year decommissioning

- period in the no-action baseline case, and presents license renewal scenarios with 42, 72, and 102 year decommissioning periods. *See* 2011 Sheppard Report at 5-6 (NYS000230). In addition to property values impacts, Dr. Sheppard also considers property tax revenue impacts (caused by the property value impacts), as well as Entergy's PILOT and other tax payments to local communities. *See* January 2011 Sheppard Report at 2-3 (NYS000230). Because the January 2011 Sheppard Report is more detailed and represents NYS's latest decommissioning assumptions, my report primarily focuses on this more recent report rather than the 2009 Sheppard Report.
- The December 2011 Sheppard Report contains yet another approach Dr. Sheppard characterizes as "similar in spirit" to "event studies" that are applied to the values of stocks and other financial assets. December 2011 Sheppard Report at 4 (NYSR00231). He bases his assessment on a calculated rate of return on certain repeat home sales near Indian Point. *See* Sheppard Testimony at 14 (NYSR00224), 2011 Sheppard Report at 4 (NYS000231). Although this new approach is the focus of his testimony, Dr. Sheppard apparently still intends to rely on his earlier reports. *See* Sheppard Testimony at 4 (NYSR00224) (noting that the final report, "like its predecessors, reflects [his] analysis and opinions"). However, it is unclear how Dr. Sheppard intends to rely on his earlier reports as the December 2011 Sheppard Report contains an entirely new type of analysis. Nevertheless, we address the earlier reports in this testimony.

Q111. Is the alleged property value impact discussed in any of Dr. Sheppard’s reports directly related to impacts to the physical environment?

A111. (GST, DPC) Although Dr. Sheppard states that the property value impact is related to offsite land use impacts, there is no evidence that the alleged property value impact associated with the presence of the power plant as discussed by Dr. Sheppard is directly related to land use impacts or any other impacts to the physical environment. To the contrary, the researchers Dr. Sheppard cites and relies upon have attributed potential relationships between the presence of nuclear power plants and property values to public perceptions and preferences and have not suggested that this relationship is the result of any adverse impact to the physical environment. For example:

- Dr. Sheppard cites a thesis by one of his undergraduate students as evidence of significant property value impacts associated with another nuclear plant (Pilgrim Nuclear Power Station). December 2011 Sheppard Report at 12 & n.3 (NYS000231). This undergraduate thesis, however, attributes this purported property value impact to “the risks of living near Pilgrim Station [that] have invaded the public consciousness,” “the fear of living near the nuclear plant,” and “public perception of risk.” Prest Study at 3, 68, 71 (NYS000232).
- Dr. Sheppard relies on a journal article by Sherman Folland and Robin Hough entitled, “Externalities of Nuclear Power Plants: Further Evidence,” which concludes that the authors’ “data support the proposition that a public perception of nuclear risk causes a change in land prices.” Folland and Hough, *Externalities of Nuclear Power Plants* at 749 (NYS000233).

- Dr. Sheppard also relies on the study by David Clark and Leslie Nieves, entitled, “An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values” (1994), which attributes potential property value impacts near nuclear power plants to the “risk” of an accident and “public aversion” to nuclear plants. D. Clark and L. Nieves, *An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values* at 236 n.4, 250 (NYS000235).
- Dr. Sheppard cites a study by David Clark et al., entitled “Nuclear Power Plants and Residential Housing Prices” which also assesses the potential for property value impacts due to “perceptions of risks toward nuclear technology.” Clark et al.: *Nuclear Power Plant and Residential Housing Prices* at 509 (NYS000236).

Thus, even the studies relied upon by Dr. Sheppard suggest that any impacts on property values from the presence of nuclear power plants are the result of risk and public aversion to nuclear power rather than any physical impacts to the environment.

B. Rebuttal to 2007 Sheppard Report

Q112. Please describe the basis for Dr. Sheppard’s assertions regarding ongoing property value impacts as described in his original 2007 Report.

A112. (GST) In the 2007 Sheppard Report, “Potential Impacts of Indian Point Relicensing on Property Values” (Nov. 29, 2007) (NYS000226), Dr. Sheppard states that the continued presence of Indian Point results in an adverse impact to property values within 2 miles of the site of approximately \$576 million. *See* 2007 Sheppard Report at 4, 6 (NYS000226).

Relying on the 1974 Blomquist study (NYS000234), Dr. Sheppard states that “there was a clear and statistically significant impact of [coal] power plants on property values” up to a distance of 11,500 feet from the facility (*i.e.*, about 2 miles). 2007 Sheppard Report at 2-3

(NYS000226). According to Dr. Sheppard, as a general matter, the adverse impact on property values from nuclear power plants is even greater than the impact from coal plants, such as the one studied by Blomquist. *See* 2007 Sheppard Report at 4 (NYS000226). As support for this assumption, the 2007 Sheppard Report relies on the study by David Clark and Leslie Nieves, entitled “An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values” (1994), which I described previously (NYS000235). *See* 2007 Sheppard Report at 3 (NYS000226).

Using 2000 U.S. Census data, Dr. Sheppard calculates that the value of residential owner-occupied and rental properties within 2 miles of Indian Point is approximately \$2.2 billion. 2007 Sheppard Report at 4 (NYS000226). The 2007 Sheppard Report then estimates that, based on market values in 2007, these residential properties within 2 miles of Indian Point were valued at approximately \$4.3 billion in 2007 (*i.e.*, an increase of 93 percent from the first quarter of 2000). *See* 2007 Sheppard Report at 5 (NYS000226). Adapting a coefficient from the Blomquist coal plant study, Dr. Sheppard calculates that—but for the presence of the Indian Point facility and its spent fuel—property values within 2 miles of the site would be higher by approximately \$576 million (*i.e.*, about 13 percent higher). *See* 2007 Sheppard Report at 5-6 (NYS000226). Based on this estimate, Dr. Sheppard concludes that this impact cannot be considered SMALL. *See* 2007 Sheppard Report at 4 (NYS000226).

Q113. Does the 2007 Sheppard Report provide an appropriate basis for concluding that continued IP2 and IP3 operations will have a MODERATE or LARGE impact?

A113. (GST) No. The basis for the purported \$576 million impact in the 2007 Sheppard Report is seriously flawed. Therefore, the conclusion that Indian Point currently has MODERATE or LARGE adverse impacts, and that such impacts will continue in the license renewal term, is extremely speculative and is not supported by credible scientific evidence.

There are three primary reasons, which I discuss further below, why Dr. Sheppard's 2007 report is flawed: (1) based on the economic assessments of nuclear power plants I previously discussed, Dr. Sheppard should have applied a zero property value effect rather than the negative property value effect derived from Blomquist's coal plant study; (2) even if the coal plant study had been applicable, which it is not, Dr. Sheppard overestimated Indian Point's effects on rental properties; and (3) Dr. Sheppard used abnormally-high housing prices, which overstated property value effects.

Q114. Please explain why Dr. Sheppard should have applied a zero property value effect instead of using the Blomquist coal-plant study.

A114. (GST) Dr. Sheppard's 2007 calculation relies on applying a coefficient derived from a regression coefficient from the 1974 Blomquist study of a 25 MW coal plant in Winnetka, Illinois. *See* 2007 Sheppard Report at 2 (NYS000226). Blomquist uses his estimated regression coefficient to calculate, based on variable mean values, that a one percent increase in distance from the Winnetka coal plant is associated with a 0.09 percent increase in residential property values, up to a distance of 11,500 feet (*i.e.*, about 2 miles). G. Blomquist, *The Effect of Electric Utility Power Plant Location on Area Property Value* at 99 (NYS000234). Dr. Sheppard's

estimate using the Blomquist study is the basis of his claim that Indian Point has a negative effect on property values.

As I noted in response to Question 27, the plant studied by Blomquist was a small, old, coal-fired plant; not a nuclear plant. Although reliance on this study may be appropriate in some cases, the coal plant results are inapplicable to the area surrounding Indian Point because of the nature of coal plants, in general, and because of the particular nature of the Winnetka power plant studied by Blomquist. Specifically, air pollutants from coal plants act to depress surrounding property values due to potential physical and health effects. See Tolley Report at 29 (ENT000144); G. Blomquist, *The Effect of Electric Utility Power Plant Location on Area Property Value* at 97-99 (NYS000234). In contrast, nuclear plants do not emit air pollutants as part of the electrical generation process. Therefore, the mechanism by which coal-plants physically influence property values is completely different from the way nuclear plants may influence property values.

In addition, the Winnetka power plant and residential properties in surrounding areas are particularly bad choices for use in estimating the effects of Indian Point on surrounding areas. Indeed, Blomquist's study likely overstates the effects even for contemporary coal plants. The Winnetka plant was already over 70 years old at the time the Blomquist article was written, and the plant had no pollution abatement equipment installed, since the Clean Air Act leading to controls was not enacted until 1972. Tolley Report at 29 (ENT000144).

In contrast to the 2007 Sheppard Report, which unreliably transfers a coal plant study to the nuclear context, there is direct evidence from studies at other nuclear sites and my own direct estimate indicate that *the most likely estimate is zero*. Tolley Report at 29 (ENT000144). These studies show that there is no reliable basis for concluding that proximity to a nuclear power plant

has an impact on residential property values. Thus, in my opinion, Dr. Sheppard used an irrelevant negative property value effect from a coal plant instead of a more appropriate value of zero. This error, in itself, is sufficient to invalidate the basis of 2007 Sheppard Report property value impact estimate and its subsequent use in the 2009 and January 2011 Sheppard Reports.

Q115. Citing the Clark and Nieves (1994) study, Dr. Sheppard states that the impact of nuclear plant “is more than 3 times the impact of coal plants and more than 4 times the impact of gas and oil fired generating facilities.” 2007 Sheppard Report at 3 (NYS000226). Do you agree with this statement?

A115. (GST) No. As noted previously in response to Question 95, evidence from existing studies that focused on a reasonable geographic area around specific nuclear power plants indicate that there is no reliable basis for concluding that proximity to nuclear power plants causes lower property values. The Clark and Nieves (1994) study was very different than these other nuclear power plant studies and instead focused on broad, inter-city property value impacts. Because of the broad geographic areas being investigated and the apparent inconsistencies in the results I noted previously, the Clark and Nieves (1994) study does not contain the information needed to estimate effects of an individual plant in a local setting and does not provide a valid basis to apply the Blomquist study to Indian Point.

Q116. Dr. Sheppard states that these other studies you reference are inapplicable because they “openly combine both the impact of job accessibility with the impact of disamenity and, nuisance associated with proximity to the nuclear power plants.” According to Dr. Sheppard, such studies could only be used “for estimating the impact of the nuclear power plant ONLY in the case where the counterfactual being evaluated was complete removal of the plant and abandonment of the land.” 2007 Sheppard Report at 3 (NYS000226). Do you agree with this statement?

A116. (GST) No. Dr. Sheppard’s reason for not considering these other nuclear power plant studies finding no property value impacts is without merit. Clark et al. (1997) did not “openly combine” effects of job accessibility and nuisance associated with nuclear power plants—rather, it simply relied on actual property values. 2007 Sheppard Report at 3 (NYS000226). Trying to separate the “pure” nuisance effect from a job accessibility effect, even if it could be done, is irrelevant because the important question is what is the overall net impact of the presence of a nuclear plant on property values. Any estimate attempting to relate the effect of a power plant to observed property values would automatically involve the implicit combination of job accessibility and nuisance, including the Blomquist coal plant study. Thus, if it were truly improper to combine the consideration of effects of job accessibility and nuisance associated with nuclear power plants, then it would also be inappropriate to rely upon the Blomquist study for the same reason.

Nonetheless, putting this issue aside, by studying Rancho Seco, a plant that is no longer operating, employed very few workers, and paid no property taxes, Clark et al. (1997) essentially controlled for employment and tax impacts and still found no adverse property value impacts despite the presence of the plant and its spent fuel. W. Metz and D. Clark, *The Effect of*

Decisions About Spent Nuclear Fuel Storage on Residential Property Values, 17 Risk Analysis 571, 509 (Oct. 1997) (ENT000155).

Thus, in my opinion, Dr. Sheppard improperly uses the Blomquist study to estimate the property value impact from Indian Point. In doing so, Dr. Sheppard ignores a number of more recent studies involving nuclear plants, which in many ways, are similar to Indian Point. See D. Clark, L. Michelbrink, T. Allison, and W. Metz, *Nuclear Power Plants and Residential Housing Prices* (NYS000236); H. Gamble and R. Downing, *Effects of Nuclear Power Plants on Residential Property Values* (ENT000145). These studies strongly suggest that nuclear plants have no net adverse impact on property values, and that there are no significant changes to property values once nuclear plants shut down and operations cease.

Q117. Please explain why Dr. Sheppard's inclusion of rental properties over-estimated the effect of Indian Point.

A117. (GST) Dr. Sheppard speculated that renters would exhibit the same valuation of the proximity of a nuclear power plant as owners. See 2007 Sheppard Report at 4 (NYS000226). However, peer reviewed studies have found that renters place a lower value on amenities than owners. See, e.g., P. Linneman, *Some Empirical Results on the Nature of the Hedonic Price Function for the Urban Housing Market*, 8 J. of Urban Economics 47 (1980) (ENT000157); Feitelson et al., *The Impact of Airport Noise on Willingness to Pay for Residences*, 1 Transportation Research 1 (1996) (ENT000158). Individuals decide to rent or own their dwelling based on factors such as household income and planned duration at the residence. These characteristics influence valuation of amenities and disamenities and research shows that owners are willing to pay a higher premium than renters to avoid disamenities. See, e.g., Feitelson et al., *The Impact of Airport Noise on Willingness to Pay for Residences* at 9-12

(ENT000158). Thus, there is no justification for applying the same impact on rental and owner-occupied housing units and, in assuming that renters and owners have the same willingness to pay for avoidance of disamenities, which they do not, Dr. Sheppard inflates his estimated property value impact.

Q118. Please explain why Dr. Sheppard’s housing price calculation overstates his property value impact.

A118. (GST) In developing his overall property value impact calculation, Dr. Sheppard converted housing values from prices in the first quarter of 2000, to prices in the first quarter of 2007. 2007 Sheppard Report at 5 (NYS000226). More specifically, Dr. Sheppard uses the Office of Federal Housing Enterprise Oversight (“OFHEO”) House Price Index for single family homes in New York State. 2007 Sheppard Report at 5 (NYS000226). Drawing on the Housing Price Index data that were current at the time of the Second Sheppard Report, he arrives at a 93 percent increase in prices. *See* 2007 Sheppard Report at 5 (NYS000226). These 2007 data have been subsequently revised by the OFHEO, and the current change in housing prices between the first quarter of 2000 and the first quarter of 2007 is 84 percent. More importantly, the 2007 data incorporates the rise in housing prices associated with, essentially, the height of the housing price bubble. *See* Tolley Report at 40 (Figure 3) (ENT000144). The bubble has since burst. Adjusting housing values from the first quarter of 2000 prices to the first quarter of 2011 prices results in a 71 percent increase, which is substantially smaller than the increase in housing values Dr. Sheppard uses. Tolley Report at 30 (ENT000144).

C. Rebuttal to January 2011 Sheppard Report

Q119. Please describe the basis for the four scenarios and baseline evaluation in the January 2011 Sheppard Report.

A119. (GST) In the January 2011 Report, Dr. Sheppard uses the \$576 million property value impact estimation from his 2007 Report as the starting point for his analysis. *See* January 2011 Sheppard Report at 1 (NYS000230). Using this value as the assumed current property value impact, Dr. Sheppard calculates the discounted present value, using a 4 percent discount rate, for what he considers to be costs resulting from four different license renewal scenarios relative to a no-action baseline scenario in which the IP2 and IP3 operating licenses are not renewed. *See* January 2011 Sheppard Report at 5-6 (NYS000230). In this evaluation, Dr. Sheppard considers impacts to: (1) property values associated with distance from the site; (2) property tax revenues caused by property value impacts; and (3) PILOT and other tax payments from Entergy. *See* January 2011 Sheppard Report at 2 (NYS000230).

The assessment provided in the January 2011 Report considers the following no-action alternative baseline and four other scenarios with different dates for completion of decommissioning and spent fuel removal, which are summarized in Table 2 of my report (ENT000144) as follows:

Dr. Sheppard's January 2011 Report Scenarios				
<i>Scenario</i>	<i>End of IPEC Operations</i>	<i>End of IPEC Decommissioning</i>	<i>Length of Decommissioning Period</i>	<i>Difference between Scenario Impact and Baseline</i>
Baseline	2015	2047	32	-
1	2015	2077	62	\$169,429,649
2	2035	2077	42	\$169,429,649
3	2035	2107	72	\$221,667,973
4	2035	2137	102	\$237,774,023

Source: Tolley Report at 31 (ENT000144), developed from 2011 Sheppard Report at 3-6 (NYS0000230).

Based on this assessment, the 2011 Sheppard Report concludes that, relative to the baseline no-action alternative, the three license renewal scenarios impose a cost on the local communities whose present value is between \$169 million and \$238 million. *See* 2011 Sheppard Report at 6 (NYS0000230). There is no difference between Scenarios 1 and 2—according to the 2011 Sheppard Report, both scenarios impose a cost whose present value is \$169 million. *See* 2011 Sheppard Report at 5 (NYS0000230). Scenario 3 imposes a cost whose present value is \$222 million while the cost under Scenario 4 is approximately \$238 million. *See* 2011 Sheppard Report at 6 (NYS0000230).

Q120. Do you agree with the conclusions in Dr. Sheppard’s January 2011 Report?

A120. (GST, DPC, CWR) No. As discussed previously in response to Question 113, the \$576 million impact in the 2007 Sheppard Report is completely unsupported and, thus, Dr. Sheppard’s January 2011 Report is likewise invalid because it assumes this value is correct.

Furthermore, aside from starting with the invalid \$576 million property value impact, Dr. Sheppard includes unreasonable and unexplained assumptions regarding: (1) the expected length of the decommissioning period; (2) the discounting of future events; and (3) the level of PILOT payments, property taxes, and other taxes during the license renewal period and after IP2 and IP3 cease operations. Tolley Report at 31-32 (ENT000144).

Q121. Have you developed a formula to help illustrate Dr. Sheppard's evaluation?

A121. (GST) Yes. Considering the variables addressed in the January 2011 Sheppard Report, the difference between license renewal and the no-action alternative can be illustrated by the following formula, as discussed in my report:

Effect of Distance from Site

(Difference in Present Value of Distance Effect Between License Renewal & No-Action)

Plus

Property Tax Revenue Effect

(Difference in Present Value of Tax Revenue Between License Renewal & No-Action)

Plus

PILOT Payment Effect

(Difference in Present Value of PILOT Payments Between License Renewal & No-Action)

Equals

Total Effect

Tolley Report at 28 (ENT000144).

Q122. You indicated that the assumed decommissioning timeframes in the January 2011 Sheppard Report are unreasonable. Please explain why.

A122. (CWR) The assumptions used in the January 2011 Sheppard Report are inappropriate and unsupported. The proper assumptions to use for both the no-action alternative and the license renewal alternative would involve Entergy continuing to operate IP2 and IP3 until the licenses expire, followed by decommissioning activities conducted in accordance with NRC requirements and Entergy's stated plans.

Specifically, NRC regulations allow for up to a 60-year SAFSTOR period. *See* 10 C.F.R. § 50.82. Although some plants have completed decommissioning faster than the permitted 60-year period, NRC has never imposed such a requirement on a licensee. Thus, there is no precedent for assuming that the NRC is likely to order immediate or even accelerated decommissioning of Indian Point.

Further, in accordance with NRC regulations, Entergy has adopted a decommissioning strategy that involves taking up to 60 years before fully completing decommissioning of the site. *See* NL-08-144, Letter from J. E. Pollock, Entergy, to NRC, “Unit No. 1 and 2, 10 CFR 50.54(bb) Program for Maintenance of Irradiated Fuel” (Oct. 23, 2008) (ENT000141); NL-10-123, Letter from J.E. Pollock, Entergy, to NRC, Unit 3 Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost Analysis in Accordance with 10 CFR 50.54 (bb) and 10 CFR 50.75(f)(3) (Dec. 10, 2010) (ENT000142). This timeframe is used in the Indian Point-specific programs for managing spent fuel following permanent cessation of operations, which have been preliminarily approved by the NRC, as well as Entergy’s preliminary decommissioning cost estimate. *See* Letter from J. P. Boska, NRC, to Entergy, “Indian Point Nuclear Generating Unit Nos. 1 and 2 – Safety Evaluation Re: Spent Fuel Management Program and Preliminary Decommissioning Cost Estimate” (Mar. 17, 2010) (ENT000159); Letter from J.P. Boska, NRC, to Entergy, “Indian Point Nuclear Generating Unit No. 3 – Safety Evaluation Re: Spent Fuel Management Program and Preliminary Decommissioning Cost Estimate” (June 22, 2011) (ENT000160).

Based on the foregoing, for both the no-action and license renewal assessment, the appropriate comparison should involve up to a 60-year decommissioning timeframe. Thus, under the no-action alternative, the proper decommissioning timeframe would be 2073—

expiration of the original IP2 license in 2013, plus 60 years. Similarly, in assessing the impacts of the proposed license renewal, the proper decommissioning timeframe would be 2093—expiration of the renewed IP2 license in 2033, plus 60 years.

Dr. Sheppard's baseline no-action alternative scenario has Indian Point being available for alternative use by 2047. January 2011 Sheppard Report at 3-4 (NYS000230). However, the 32-year site-reclamation timeframe in Dr. Sheppard's baseline scenario is not consistent with the decommissioning period that Entergy adopted in its submittals to NRC referenced previously. Further, Dr. Sheppard provides no adequate basis for his assumption that Indian Point will be available for alternative use by 2047.

Dr. Sheppard's analysis also includes unjustified license renewal scenarios. For example, he includes scenarios that assume completion of site cleanup and reclamation in 2107 and 2137, respectively. January 2011 Sheppard Report at 4 (NYS000230). Both of these scenarios would necessarily have to involve Entergy's requesting, and the NRC's approving, a decommissioning period for IP2 and IP3 in excess of 60 years. Dr. Sheppard provides no discussion or basis for assuming either of these two events.

Q123. Please discuss why the discounting of future events in the January 2011

Sheppard Report is unreasonable.

A123. (GST) As I mentioned in response to Question 121, for purposes of illustrating the difference between license renewal and the no-action alternative, the Total Effect can be thought of as the net present value of the sum of the Distance Effect, Property Tax Revenue Effect, and PILOT Payment Effect. Because people favor benefits now to benefits later, and because the future is inherently uncertain, a \$1 payment today is preferred to a \$1 payment 60 years from now. Tolley Report at 26 (ENT000144). Using a discount rate in the evaluation of future scenarios allows researchers and policy makers to properly weigh the costs and benefits of a proposed action when these costs and benefits either accrue over a period of many years or at a single point in time many years in the future. Tolley Report at 26 (ENT000144). Discounting lessens the impact of the costs and benefits that arise further in the future relative to those costs and benefits that occur in periods closer to the present. Tolley Report at 26 (ENT000144). This calculation gives the present value, or what these costs and benefits are worth today; the net present value is the sum of the future benefits less the sum of the future costs. Tolley Report at 26 (ENT000144). However, given the 60-year decommissioning timeframe Mr. Reamer just discussed, these calculations need to appropriately account for a time horizon cut-off. At a minimum, a more appropriate discount rate should have been used.

Q124. What do you mean by a “time horizon cut-off”?

A124. (GST) Given the difficulty of grappling with imponderable future events, people focus on events closer at hand that are of more immediate importance. People have limited horizons in their ability to think about the future, as uncertainty increases as increasingly distant years are contemplated. Tolley Report at 27 (ENT000144). Beyond some point, the most

realistic decision-making procedure is to not count far-off events at all, but rather to focus instead of the more important near-term events that will affect well-being within buyers' lifetimes. A 25-year cutoff may be a generous estimate of the horizon within which future events are of concern. Tolley Report at 27 (ENT000144).

If, contrary to the estimates from previous studies and my own report that there is no effect of plant proximity on property values, there were in fact a property value effect leading to a property value rebound after decommissioning, the rebounds would occur at the earliest in 2073. Tolley Report at 27 (ENT000144). This is far beyond a 25-year cutoff, and so realistically would not be expected to influence current property values at all.

Q125. Assuming that it were appropriate to calculate potential distant future property value impacts using a present value calculation instead of using a time horizon cut-off, is Dr. Sheppard's discount rate appropriate?

A125. (GST) No. Putting aside that a time horizon cut-off is warranted in this case and, even if such a cut-off were ignored, the 4 percent discount rate Dr. Sheppard uses is in my judgment far too low to calculate the present value of the alleged distance impact from Indian Point. This low discount rate inappropriately inflates his calculated property value impacts results. Empirical studies indicate that discount rates for consumer purchases of durables are approximately 20 percent. See Jerry A Hausman, *Individual Discount Rates and the Purchase and Utilization of Energy-using Durables*, 10 Bell J. of Econ. 33 (Fall 1979) (ENT000161); Jeffrey A. Dubin and Daniel L. McFadden, *An Econometric Analysis of Residential Electric Appliance Holdings and Consumption*, 52 *Econometrica* 345 (Mar. 1984) (ENT000162).

Q126. Why does Dr. Sheppard select a 4 percent discount rate?

A126. (GST) Dr. Sheppard states that this discount rate was selected because it approximates current mortgage rates less the current rate of inflation. January 2011 Sheppard Report at 5 (NYS000230).

Q127. Is Dr. Sheppard's reasoning for selecting a 4 percent discount rate sound?

A127. (GST) No. The use of a mortgage rate of interest to discount effects of future events on property values is inappropriate because the rate of interest charged on a mortgage is less than the discount rate of concern to buyers and sellers of real estate. A mortgage rate is a rate paid to a lender whose risk is reduced by the collateral of the residence to secure the loan, whereas the appropriate discount rate for the buyer of a residence is higher because the buyer's risk is actually increased rather than decreased by a mortgage loan. For example, the residence will be lost if the risk of missed mortgage payments materializes, causing a potentially greater loss to the buyer whereas the lender acquires a valuable tangible asset.

Q128. What discount rate do you apply?

A128. (GST) In my calculations, I conservatively selected a 7 percent discount rate. This discount rate is recommended by NRC best practices guidelines to reflect a discount rate that broadly estimates the pre-tax rate of return to private capital. *See* U.S. Nuclear Regulatory Commission, NUREG/BR-0058, Rev. 4, Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission at 32 (Sept. 2004) (ENT000013). Although the econometric studies I just discussed indicate that the rate is almost certainly greater than 7 percent, this rate can be used in the calculations here as a conservatively low estimate.

Q129. Before discussing the flawed PILOT assumption in the January 2011 Sheppard Report, first please describe the results of Dr. Sheppard’s method had he applied the standard NRC decommissioning period of 60 years and a discount rate of 7 percent.

A129. (GST) Although there is no evidence to support his estimate, assuming Dr. Sheppard’s \$576 million distance effect of Indian Point on surrounding property values is correct, it is possible to calculate what Dr. Sheppard’s net impacts would be if he used the 60-year NRC decommissioning period and a more realistic discount rate of 7 percent. In my report, this calculation is labeled as “Dr. Sheppard’s Method with Correct Decommissioning Period and Incorrect PILOT Payments.” Tolley Report at 32-33 (ENT000144). The calculation is:

Dr. Sheppard's Effect of Distance from Site

Difference in Present Value of Distance Effect Between Ceasing Operations in 2035 and

2015

\$2.57 million minus \$9.94 million equals -\$7.37 million

Plus

Dr. Sheppard's Property Tax Revenue Effect

Difference in Present Value of Tax Revenue Between Ceasing Operations in 2035 and

2015

\$0.87 million minus \$3.35 million equals -\$2.49 million

Plus

Dr. Sheppard's PILOT Payment Effect

Difference in Present Value of PILOT Payments Between Ceasing Operations in 2035 and

2015

\$282.06 million minus \$282.06 million equals \$0

Equals

Dr. Sheppard's Total Effect

-\$9.86 million

Tolley Report at 32-33 (ENT000144).

By using the 60-year NRC decommissioning period and a 7 percent discount rate instead of Dr. Sheppard's values, his estimated impact of renewal on property values shrinks from a loss of between \$169 million and \$238 million in the scenarios in his 2011 report to just \$9.86 million.

Q130. Does Dr. Sheppard include reasonable assumptions about PILOT payments under the no-action alternative?

A130. (DPC, CWR) No. Dr. Sheppard assumes that PILOT payments would be the same under the no-action case as under license renewal, without any justification. *See* January 2011 Sheppard Report at 4 (NYS000230). Although Dr. Sheppard apparently recognized that PILOT payments could cease or be greatly reduced upon cessation of operations, he nonetheless assumes “that Entergy continues these payments through 2035 in all scenarios.” January 2011 Sheppard Report at 4 (NYS000230).

Q131. What level of PILOT payments is expected under license renewal and once IP2 and IP3 cease operations?

A131. (DPC, CWR) PILOT and tax payments would remain relatively unchanged under license renewal. FSEIS at 4-46 (NYS00133B). However, after current operations cease and electricity is no longer being generated, it is unlikely that PILOT payments, property taxes, and other taxes would remain at their current levels. *See* NUREG-0586, Supp. 1, Vol. 1, Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities at J-4 to J-8 (Nov. 2002) (ENT000163). Once IP2 and IP3 cease operations at the end of their NRC licenses, Entergy would be liable for property taxes at then current rates, although the value of the units would be diminished. *See* Levitan Report at 102-103 (NYS000056). Based on a review of the average of PILOT and property tax payments at several other commercial nuclear plants that permanently ceased operation, it is reasonable to assume for purposes of this contention that Entergy’s PILOT and property tax payments would be approximately 18 percent of what they are now, reflecting that the value of the IP2 and IP3 units would decrease significantly once operations cease, given that the units would no longer be generating revenue. *See* New Horizon

Scientific, LLC, Maine Yankee Decommissioning Experience Report Detailed Experiences 1997-2004 (2005) (ENT000164); A. Philippidis, *Nuclear Plant Closing*, 41 Westchester Cnty. Bus. J. 19 (May 13, 2002), available at 2002 WLNR 5180165 (ENT000165); John Mullin and Zenia Kotval, *The Closing of the Yankee Rowe Nuclear Power Plant: The Impact on a New England Community*, in Univ. of Mass. – Amherst, Landscape & Regional Planning Faculty Publication Series (1997) (ENT000166).

Q132. Please describe the results of Dr. Sheppard’s method had he not incorrectly assumed PILOT payments are identical under both the renewal and no-action scenarios.

A132. (GST) Including the correct assumptions about differences in PILOT payments and again using a 60-year decommissioning period and 7 percent discount rate shows that the magnitude of the combined negative effects used by Dr. Sheppard is very small relative to the positive effects of PILOT payments. The result, even including Dr. Sheppard’s unwarranted negative impacts of license renewal, is a net positive impact of license renewal on area residents. Tolley Report at 33-34 (ENT000144). In other words, license renewal results in a net gain to residents in the area surrounding IPEC.

PILOT payments act to increase property values, having an effect in the opposite direction from any adverse distance effects of a nuclear site. Therefore, the loss in PILOT payments, if nuclear operations are terminated, will act to reduce property values and will do so earlier in the no-action case than in the license renewal case. The sooner nuclear operations are terminated, the greater will be the present value of the reduction in property values. For my calculations, I use the projected 2011 PILOT payments from page 102 of a 2005 Levitan & Associates report entitled “Indian Point Retirement Options, Replacement Generation, Decommissioning/Spent Fuel Issues, and Local Economic/Rate Impacts” (NYS000056). I

assume that the \$23.99 million in annual payments continue while the plant is operating, and then I assume that payments decrease to 18 percent of their previous level, or a \$4.32 million annual payment, during the decommissioning period. Tolley Report at 24 (ENT000144). At the end of the decommissioning period, I assume that PILOT payments cease completely. Tolley Report at 24 (ENT000144).

Note that, because the losses begin at the time generation ceases, either 2015 with no-action or 2035 with license renewal, property value effects of loss in PILOT payments are discounted less heavily than any possible effects of proximity to the site. Tolley Report at 25 (ENT000144). PILOT payments are affected in near-term years, falling immediately in the no-action case while continuing with full force for the next 20 years if license renewal is granted. Tolley Report at 25 (ENT000144). The distance effects acting in the opposite direction, many years in the future—either 2093 with license renewal or 2073 with no action—whose present values are greatly reduced by discounting to those distant years. Tolley Report at 25 (ENT000144).

In my report, this calculation is labeled as “Dr. Sheppard’s Method with Correct Decommissioning Period and Correct PILOT Payments.” Tolley Report at 33-34 (ENT000144). Using a 7 percent discount rate, this calculation is:

Dr. Sheppard's Effect of Distance from Site

Difference in Present Value of Distance Effect Between Ceasing Operations in 2035 and

2015

\$2.57 million minus \$9.94 million equals -\$7.37 million

Plus

Dr. Sheppard's Property Tax Revenue Effect

Difference in Present Value of Tax Revenue Between Ceasing Operations in 2035 and

2015

\$0.87 million minus \$3.35 million equals -\$2.49 million

Plus

Dr. Sheppard's PILOT Payment Effect

Difference in Present Value of PILOT Payments Between Ceasing Operations in 2035 and

2015

\$279.04 million minus \$96.33 million equals +\$182.72 million

Equals

Dr. Sheppard's Total Effect

+\$172.86 million

Tolley Report at 33-34 (ENT000144).

In summary, the \$172.86 million dollar positive effect on property values is the result of a \$182.72 million gain from greater PILOT payments that occur with license renewal, which swamps the -\$9.86 million in unwarranted negative effects based on Dr. Sheppard's calculations. Tolley Report at 33 (ENT000144). Thus, if Dr. Sheppard had included differences in PILOT payments, with PILOT payments ending sooner under no-action than renewal, his estimates of

cost of renewal would be not a cost, but a gain to renewal. This positive PILOT effect is great enough to swamp all the worst case negative effects posited in the January 2011 Sheppard Report.

Q133. Based on your Indian Point-specific calculated property value impact, what is the net present value difference between the no-action alternative and license renewal?

A133. (GST) Based on my review of evidence from studies at other nuclear sites as well as the direct estimate from my Indian Point-specific study, the most likely estimate of the effect of proximity to the Indian Point on residential property values is zero. Tolley Report at 14 (ENT000144). As I previously discussed in response to Question 121, the difference between the no-action alternative and the proposed license renewal is the difference between the net present value of the sum of the Distance Effect, Property Tax Revenue Effect, and PILOT Payment Effect for each scenario.

Using a discount rate of 7 percent and a distance effect of \$0, the difference in present value of the distance effect between the license renewal and no-action alternative scenarios is \$0. Tolley Report at 28 (ENT000144). The difference in present value of property tax revenue between the license renewal and no-action alternative scenarios is also \$0. Tolley Report at 28 (ENT000144).

As I discussed in response to Question 132, the present value of the difference in PILOT payments between the license renewal scenario and no-action alternative scenario is a benefit of renewal of +\$182.72 million. Tolley Report at 28 (ENT000144).

The total effect, as the sum of the distance effect and the PILOT payments effect is \$0 + \$182.72 million, or simply \$182.72 million. Tolley Report at 28 (ENT000144). Dividing by 12,933 housing units Dr. Sheppard addressed in his 2007 report, *see* 2007 Sheppard Report at 4

(NYS000226), this gives a per-household net present value positive impact of license renewal of \$14,128. Tolley Report at 28 (ENT000144). In this case, because PILOT payments are reduced under the no-action alternative, the present value is substantially *higher* with license renewal rather than under the no-action alternative. Tolley Report at 28 (ENT000144).

D. Rebuttal to December 2011 Sheppard Report

Q134. Please explain how the December 2011 Sheppard Report (NYS000231) methodology differs from the methodology used in his previous reports.

A134. (GST) In the December 2011 Sheppard Report and prefiled testimony, Dr. Sheppard inexplicably departs from the Blomquist coal plant study that was the cornerstone of his earlier claims that IP2 and IP3 depress property values. In this latest report and in the prefiled testimony, Dr. Sheppard presents a new assessment, which he states is “similar in spirit” to “event studies” that are applied to the values of stocks and other financial assets.” December 2011 Sheppard Report at 3 (NYSR00231).

Q135. Can you explain Dr. Sheppard’s new methodology?

A135. (GST) Yes. In his latest methodology, Dr. Sheppard has turned away from the commonly used hedonic regression approach. Instead of using hedonic price modeling to directly estimate effects of a nuclear plant on property values, Dr. Sheppard adopts a new approach to infer such effects by calculating financial returns to holding a property over various time periods. December 2011 Sheppard Report at 3-4 (NYSR00231).

Dr. Sheppard likens IP2 and IP3 commencing full power operations in the period from 1974 to 1976 to an “event.” December 2011 Sheppard Report at 6 (NYSR00231). Dr. Sheppard hypothesizes that anyone holding properties within 3.1 miles (5 kilometers) of Indian Point between 1974 and 1976 would have suffered a property value decline, resulting in a lower return

on the property if they held property before 1974 to after 1976 than if they held property entirely before 1974 or entirely after 1976. *See* December 2011 Sheppard Report at 4-9 (NYSR00231).

Dr. Sheppard bases his analysis on a sample of properties in the Village of Buchanan and the Towns of Cortlandt and Peekskill that were (1) located within 3.1 miles (5 kilometers) of Indian Point; and (2) sold between 1999 and 2009. December 2011 Sheppard Report at 5-6 (NYSR00231). The records for these properties contain historical information on sales that occurred prior to 1999, which Dr. Sheppard uses to estimate the financial return to holding the property from time of purchase to time of sale. *See* December 2011 Sheppard Report at 5 (NYSR00231). Using this information, Dr. Sheppard estimates earlier returns to holding properties in his sample that had turned over one or more times prior to the most recent sale, going back to 1945. December 2011 Sheppard Report at 8-9 (NYSR00231).

Dr. Sheppard compares returns on properties for which the holding period was from before 1974 to after 1976, called the “treatment group,” to returns for which the holding period was entirely before 1974 or after 1976, called the “control group.” December 2011 Sheppard Report at 8 (NYSR00231). He expects to find lower returns for the “treatment group” than for the “control group” due to IP2 and IP3. December 2011 Sheppard Report at 9 (NYSR00231).

Q136. If you reviewed Dr. Sheppard’s dataset, can you provide any general observations about it?

A136. (GST) Dr. Sheppard constructed a dataset based on 507 properties, almost exclusively from his 1999 to 2009 sample. December 2011 Sheppard Report at 9 (NYSR00231). Although Dr. Sheppard does not discuss those properties only sold outside the 1999-2009 period, through review and analysis of his underlying data, it appears that there are 4 properties out of the total of his 507 properties that are only associated with sales prior to 1999. Tolley Report at

36 n.19 (ENT000144). One would not expect them to materially affect the results given their small number. Because there were multiple transactions of these 507 properties over the years, Dr. Sheppard was able to calculate the average annual nominal return for 1,511 observed sets of transactions with sales from before 1960 to the last observation in the sample in 2009.

December 2011 Sheppard Report at 9 (NYSR00231).

Based on my review, the returns for 1,347 transactions in Dr. Sheppard's "control group," with holding periods either entirely before 1974 or entirely after 1976, had an average annual return of 9.4 percent. Tolley Report at 36 (ENT000144). The returns for 164 transactions in the "treatment group," with holding periods that begin in 1974 and end after 1976, had an average annual return of 7.2 percent. Tolley Report at 36 (ENT000144).

It is to be emphasized that his estimates of earlier, pre-1999 returns are based on properties that were sold in the 1999 to 2009 period that also happened to change hands before 1999. With minor exceptions previously noted, Dr. Sheppard's sample does not include any properties that changed hands before 1999 unless they also happened to be sold in the 1999 to 2009 period.

Dr. Sheppard's sample is thus weighted toward transactions of properties that changed hands well after the period of interest in his analysis: 1974 to 1976. Tolley Report at 36 (ENT000144).

Q137. What analysis does Dr. Sheppard perform on this dataset?

A137. (GST) Dr. Sheppard compares returns on properties for which the holding period was from before 1974 to after 1976, the "treatment group," to returns for which the holding period was entirely before 1974 or after 1976, the "control group." December 2011 Sheppard Report at 8 (NYSR00231). He expects to find returns for the "treatment group" to be lower than

for the “control group” with the difference reflecting the lowering of property values due to IP2 and IP3. December 2011 Sheppard Report at 4 (NYSR00231). Dr. Sheppard performs a regression analysis of his data finding that the coefficient for the “Sale in treatment group” is statistically significant and that being in the “Treatment Group” lowers the nominal rate approximately 2.9 percent per year. December 2011 Sheppard Report at 9 (NYSR00231).

Q138. How does Dr. Sheppard calculate that increase in property values?

A138. (GST) Dr. Sheppard calculates the 27 percent reduction in property values using the average holding period from his sample and the estimated annual loss in returns from his regression. This 27 percent loss in property value was applied to the value of residential property in the 2000 Census, and then inflated to 2011 values (unnecessarily deflating first to 1976 values and then inflating from 1976 to 2011). According to Dr. Sheppard, this value in 2011 housing prices is \$1.07 billion and represents the recovery that property values allegedly could see following the removal and decommissioning of Indian Point sometime in the future, increasing values by more than 27 percent. December 2011 Sheppard Report at 12 (NYSR00231).

Q139. When does Dr. Sheppard predict this recovery would happen?

A139. (GST) Dr. Sheppard does not predict when this recovery would happen. He gives no consideration to the decommissioning period discussed previously in response to Question 122.

Q140. Does Dr. Sheppard apply a discount rate, or consider PILOT or property tax payments to estimate the difference between license renewal and the no-action alternative?

A140. (GST) No. Unlike his January 2011 Report, Dr. Sheppard does not apply a discount rate to estimate the difference between license renewal and the no-action alternative. Nor did his evaluation account for PILOT or property tax payments as was done in his January 2011 Report.

Q141. When the decommissioning period, discount rates, and PILOT payments are considered, does Dr. Sheppard's \$1.07 billion property value impact result in net positive benefits under no-action alternative?

A141. (GST) No. Using an assumed 60-year decommissioning period, 7 percent discount rate, and correct assumptions about differences in PILOT payments discussed in response to Questions 122 and 128, the magnitude of the combined negative effects Dr. Sheppard uses is small relative to the positive effects of PILOT payments. The result, even assuming Dr. Sheppard's unwarranted \$1.07 billion asserted gain under the no-action alternative, license renewal results in a net positive impact to area residents. Tolley Report at 53-54 (ENT000144).

As I explained in response to Questions 132 and 133, because losses begin at the time generation ceases, in either 2015, with no-action or 2035, with license renewal, property value effects of loss in PILOT payments are less heavily discounted than any other property value impact. PILOT payments are affected in near-term years, falling immediately in the no-action case while continuing with full force for the next 20 years if license renewal is granted. The property value impact acts in the opposite direction, many years in the future—either 2093 with

license renewal or 2073 with no action—whose present values are greatly reduced by discounting to those distant years.

Using a 7 percent discount rate, this calculation is:

Effect of Distance from Site

Difference in PV of Distance Effect Between Ceasing Operations in 2035 and 2015

\$4.77 million minus \$18.47 million equals -\$13.69 million

Plus

Property Tax Revenue Effect

Difference in PV of Tax Revenue Between Ceasing Operations in 2035 and 2015

\$1.61 million minus \$6.23 million equals -\$4.62 million

Plus

PILOT Payment Effect

Difference in PV of PILOT Payments Between Ceasing Operations in 2035 and 2015

\$279.04 million minus \$96.33 million equals +\$182.72 million

Equals

Total Effect

+\$164.41 million

Tolley Report at 53-54 (ENT000144).

The \$164.41 million dollar positive effect on property values results from a \$182.72 million gain from greater PILOT payments occurring with license renewal, which swamps the - \$18.31 million in asserted negative effects (*i.e.*, the -\$13.69 million distance impact plus the associated -\$4.62 million tax revenue impact) based on Dr. Sheppard's calculations. Tolley Report at 54 (ENT000144). In other words, the positive PILOT effect is great enough to swamp

all the worst case negative effects the December 2011 Sheppard Report posits. Thus, the no-action alternative results in a net present value \$164.41 million loss to local communities surrounding Indian Point even if one assumes that a current asserted \$1.07 billion negative impact would disappear once the site was decommissioned.

Q142. Does the assessment in the December 2011 Sheppard Report provide a reliable, scientifically-accepted approach to determine whether Indian Point license renewal will result in adverse property value impacts?

A142. (GST) No. Taken uncritically, Dr. Sheppard appears to corroborate his hypothesis that holding properties within 5 kilometers of the Indian Point site during the 1974 to 1976 period lowered returns. However, Dr. Sheppard has taken an unprecedented approach for estimating property value impacts that is unreasonable for multiple, independent reasons. Specifically, the December 2011 Sheppard Report: (1) contains an extraordinary number of data errors; (2) fails to use a realistic “control” group; (3) incorrectly defines the period of 1974 to 1976 as the “event” of interest; (4) violates a number of important methodological requirements for a valid event study; and (5) avoids the well-established hedonic approach. With regard to this fifth point, Dr. Sheppard’s own data source contains sufficient information for a hedonic regression analysis, the results of which corroborate the findings from other nuclear plant studies and from my own MLS hedonic regression analysis demonstrating that Indian Point has no discernible effect on property values. In addition to these five primary points, there are also a litany of other problems with the December 2011 Sheppard Report, which are referenced in my expert report.

Q143. Before expanding upon the major flaws of the December Sheppard Report 2011, please describe why Dr. Sheppard abandoned the coal plant approach and his reliance on the Blomquist study.

A143. (GST) Neither Dr. Sheppard's December 2011 Report nor prefiled testimony mentions the Blomquist study that figured so prominently in his earlier reports. Dr. Sheppard relied on the Blomquist study as the cornerstone of his claim that IP2 and IP3 depress land values. In the December 2011 filings, the only mention of coal plant effects is in a fleeting question and answer passage on page 12 of the prefiled testimony (NYSR00224) where Dr. Sheppard notes that while the actual impact itself might be very different, the methodology used to measure the impact from a coal-fired electric generating facility is the same as the methodology used to measure the impact from a nuclear electric generating facility. *See* Sheppard Testimony at 12 (NYSR00224). Nothing is heard again of coal plants or the study by Dr. Blomquist.

Q144. Please describe the data errors you identified in December 2011 Sheppard Report and why these errors invalidate the conclusions in that report.

A144. (GST) Dr. Sheppard's work contains an extraordinary number of data errors that should have excluded observations from his sample. The most common error was the inclusion of a previous sale of an empty lot and a subsequent sale of a completed residence in the calculation of rate of return. Such observations neglect the cost of building a residence on the property during the time it is held, thus grossly distorting the net return to holding the real estate by leaving out a major expense.

Among other errors were inclusion of:

- Typographical errors in the sale date or price for a transaction;

- Transactions between family members, which should be excluded because they are not arm's length market transactions and are subject to personal family motivations;
- Foreclosures and auctions, which are also not ordinary market transactions;
- Properties in which the residence was destroyed in a fire or demolished between two transactions, leading to effect of losses in value not accounted for in the rate of return;
- Transactions of commercial properties;
- Sales prices marked as “unverified” by the Assessor;
- Sales prices that were noted by the Assessor as FHA-subsidized purchases that are marked as “not indicative of market value”; and
- Transactions involving large purchases of land that were subsequently subdivided and developed into residential housing.

Tolley Report at 56 (ENT000144).

In additional cases, a typographical error in the address of the property or other geocoding error caused the property to be assigned the incorrect location by Dr. Sheppard. Some of these should not have been included in the analysis at all because their true distance from Indian Point was greater than 5 kilometers.

Dr. Sheppard claims to have personally supervised the data entry process and to have been “in regular contact with [New York Attorney General’s] office undertaking the data entry.” December 2011 Sheppard Report at 6 (NYSR00231). But a review of Assessor’s property cards, Dr. Sheppard’s data source, reveals an error rate in the final sample so high that the usability of his empirical findings must be questioned.

Out of the 1,511 observations in Dr. Sheppard’s basic regression, 425 observations or over one-quarter of the observations (28 percent) should have been excluded from the sample

due to such errors. Tolley Report at 56 (ENT000144). As a breakdown of this total, out of Sheppard's 164 "treatment group," observations, 86 or over one-half (52 percent) should have been excluded from the sample. Tolley Report at 56 (ENT000144). Out of the 1,347 Sheppard "control group" observations, 339 or one-quarter (25 percent) should have been excluded from the sample. Tolley Report at 56 (ENT000144).

The extraordinarily high error rate makes it inappropriate to rely on Dr. Sheppard's analysis. In other words, if you enter incorrect data, then the results cannot be helpful.

Q145. Please describe why the "control group" in the December 2011 Report was unrealistic and how this impacts Dr. Sheppard's findings.

A145. (GST) Dr. Sheppard's use of the difference in average annual returns between the "treatment group" and the "control group" as a measure of the effect of 1974 to 1976 events would be straightforward if there had been one constant yearly rate of return to holding property in every year except for a lower rate of return for the 1974 to 1976 period. However, this condition is not even approximately fulfilled over Dr. Sheppard's long sample period extending from before 1960 until 2009. Tolley Report at 38 (ENT000144).

Q146. Why does the lack of a constant return over the 1960 to 2009 period invalidate Dr. Sheppard's comparison between the "treatment group" and "control group"?

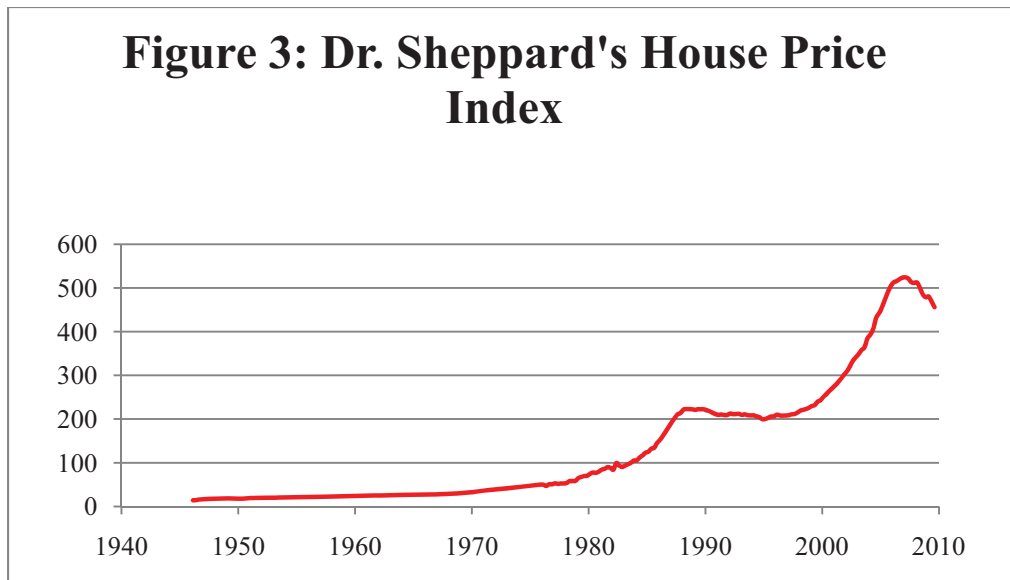
A146. (GST) Dr. Sheppard's comparison is not valid because (1) the distributions of holding periods for the "treatment group" and the "control group" are different, and (2) returns to holding property varied over the sample period for reasons other than a possible 1974 to 1976 effect. Tolley Report at 38 (ENT000144). Specifically, periods of unusually high returns in years long after 1974 to 1976 that affected the "control group" more than the "treatment group"

attest to the importance of this problem. The “control” group observations include 1999 to 2009, which is the period during which the housing bubble affecting all parts of the U.S. economy led to historically unprecedented skyrocketing property values. Tolley Report at 39 (ENT000144). Returns to selling property in this period were correspondingly unprecedentedly high. Housing prices began to fall after 2006, but the price correction was far from complete by 2009. Tolley Report at 39 (ENT000144). House prices in 2009 were still far above their levels in 2000. Tolley Report at 39 (ENT000144). Even those sales that occurred after the peak in 2006 gave unprecedented returns in many cases. Tolley Report at 39 (ENT000144).

Q147. How do you know that returns to holding property differ historically over different periods regardless of IP2 and IP3 commencing operations?

A147. (GST) The phenomenon of historically different returns in different periods is reflected in the house price index for the metropolitan region in which Indian Point is located. Tolley Report at 39 (ENT000144). A price index for this region was prepared by Dr. Sheppard himself, using an average of official Office of Federal Housing Enterprise Oversight (“OFHEO”) housing price indexes for the New York City-White Plains and Poughkeepsie metropolitan areas. *See* December 2011 Sheppard Report at 10 (NYSR00231). Dr. Sheppard’s index is reproduced below and in Figure 3 of my report.

Figure 3: Dr. Sheppard's House Price Index



Source: Tolley Report at 39-40 (ENT000144).

Dr. Sheppard used this index to translate his estimates of dollar property value effects for earlier years into 2011 prices, but fails to note that his price index corroborates the existence of differences in returns unconnected with his 1974 to 1976 period that affect returns to the “treatment group” and the “control group” differently.

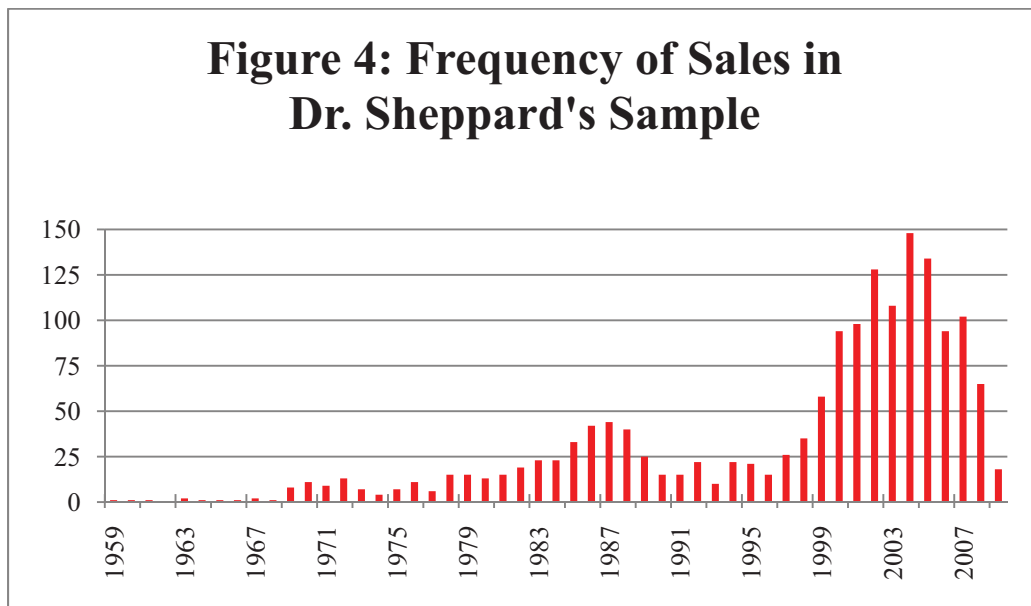
Of particular importance is the unprecedented national housing bubble in the early 21st century, reflected in the sharp rise in Dr. Sheppard’s price index on the far right-hand side of the graph beginning in 1999. The “control group” observations were much more heavily weighted toward the post-1999 period than the “treatment group” observations. Tolley Report at 39 (ENT000144). In fact, 958 of the 1,347 transactions in the “control group,” or 71 percent, occurred after 1999, whereas only 47 of the 164 transactions in the “treatment group,” or 28 percent, occurred after 1999. Tolley Report at 39 (ENT000144).

Even if holding a property during 1974 to 1976 had no effect whatsoever on returns, the average rate of return for the “control group” would have been higher than for the “treatment group” because of the greater influence of the housing bubble on average returns for the “control

group.” Tolley Report at 39 (ENT000144). The “control group” included more observations with abnormally high returns in later years than for the “treatment group,” the great majority of whose observed returns occurred long before the abnormally high returns of the bubble years. Tolley Report at 39 (ENT000144).

Q148. So are you saying the housing bubble impacted the “control group” differently than it impacted the “treatment group”?

A148. (GST) Precisely. The effect of the housing bubble on the “control group” is made more pronounced by the odd nature of Dr. Sheppard’s sample of housing returns which contains progressively fewer observations going back in time. The sample of observations is weighted especially strongly toward 1999 to 2009 transactions from which the sample of properties actually came. Tolley Report at 40 (ENT000144). Figure 4 of my report plots the number of property sales observations by year in Dr. Sheppard’s sample and is reproduced below.



Source: Tolley Report at 41 (ENT000144).

The declining frequency of sales in his sample going back in time demonstrates the sparseness of observations from the earlier periods which are of main concern in Dr. Sheppard's study. The heavy weighting of observations toward the 1999 to 2009 period accentuates the effect of later abnormally high returns in the "control group." A valid "control group" must refer to returns that would have been realized in the absence of the 1974 to 1976 "treatment." Since the returns to the "control group," as defined by Dr. Sheppard, varied greatly over time, the question arises as to which returns to use in choosing a "control group."

Dr. Sheppard's hypothesis is that property values suffered a permanent decrease from what they would have been in the absence of IP2 and IP3, and that this led to a lower return on holding property at that time within 5 kilometers of the site. *See* December 2011 Sheppard Report at 12 (NYSR00231)

Owners who divested themselves of properties prior to 1974 to 1976 would not be affected. After 1974 to 1976, the land value effect would be capitalized into lower prices paid for the property and would be taken into account by buyers so that subsequent owners would not suffer the financial loss, nor would their returns to holding the property be affected. Abnormally high returns due to a housing bubble that occurred more than 20 years after 1974 to 1976 have nothing to do with this process. Dr. Sheppard should have used a "control group" not affected by such confounding events.

Q149. Is there any way to create a control group that is not affected by these types of confounding events using Dr. Sheppard's data?

A149. (GST) While very far from perfect, eliminating returns to ownership during the 1999 to 2009 period would likely remove the worst offending period and represent some improvement. Omitting the 1999 to 2009 period reduces the number of observations in the

“control group” from 1,347 to 389. Tolley Report at 41 (ENT000144). The average yearly rate of return for the “control group” is reduced substantially, from 9.4 percent to 4.8 percent. Tolley Report at 41 (ENT000144). The number in the “treatment group” falls from 164 to 117, with a change in average yearly rate of return from 7.2 percent to 7.3 percent, which is essentially no change. Tolley Report at 41 (ENT000144).

The rate of return for the “control group” is now actually less than for the “treatment group.” In short, the hypothesis that holding property within 5 kilometers of the Indian Point site in 1974 to 1976 lowered returns does not survive the common sense procedure of using a sample of returns from which the most anomalous observations are removed.

Inspection of the house price index in the figure above (Figure 3 of my report) reveals that 1984 to 1987 was another period of high returns. As with 1999 to 2009, the rate of return during the 1984 to 1987 period had nothing to do with IP2 and IP3. By removing both 1984 to 1987 and 1999-2009 sales from the sample, the average yearly rate of return for the “control group,” which now has 291 observations, changes to 2.0 percent. Tolley Report at 42 (ENT000144). The average yearly rate of return for the “treatment group,” which now has 82 observations, remains fairly stable at 6.8 percent. Tolley Report at 42 (ENT000144). Both changes are illustrated in Table 4 of my report and reproduced below:

Table 4. The Effect of the 1999-2009 Housing Bubble Period and 1984-87 Price Surge on Mean Nominal Returns in Dr. Sheppard's Sample						
	<i>Control Group</i>			<i>Treatment Group</i>		
	Full Sample	With 1999-2009 Removed	With 1999-2009 and 1984-1987 Removed	Full Sample	With 1999-2009 Removed	With 1999-2009 and 1984-1987 Removed
Number of Observations	1,347	389	291	164	117	82
Mean Nominal Return	9.4%	4.8%	2.0%	7.2%	7.3%	6.8%

Source: Tolley Report at 42 (ENT000144).

As this table illustrates, the deletion of 1984 to 1987 in addition to 1999 to 2009 strengthens the finding that removal of anomalous observations invalidates the argument that holding property within 5 kilometers of the Indian Point site in 1974 to 1976 lowered returns.

Q150. Would the removal of these anomalous observations affect Dr. Sheppard’s regression results?

A150. (GST) Yes. The results I just discussed based on simple tabulations of returns for the “treatment group” and the “control group” are corroborated by new regressions I ran removing these anomalous observations.

As mentioned previously, Dr. Sheppard ran a regression in which the dependent variable being explained is the average annual rate of return in his sample of properties sold in the 1999 to 2009 period that includes not only returns on the 1999 to 2009 sales, but also on sales prior to that period for any of the properties in his sample that had turned over in previous years going back to before 1960. December 2011 Sheppard Report at 9 (NYSR00231). One of Dr. Sheppard’s independent variables is the zero-one indicator variable, referred to as “Sale in treatment group,” specifying whether the observation is in the “treatment group” consisting of the subset of properties held in 1974 to 1976 (*i.e.*, purchased before 1974 and sold after 1976) as

opposed to being in the “control group” consisting of returns on sales of all other properties in the sample. December 2011 Sheppard Report at 8-9 (NYSR00231). Dr. Sheppard argues that the coefficient for “Sale in treatment group” (-0.02926) implies that being in the “treatment group” lowers the yearly rate of return 2.9 percent below the average rate of return for the entire sample of 9.2 percent as reported on page 9 of the December 2011 Sheppard Report (NYSR00231).

Following the same common sense procedures I described above involving the removal of the abnormal housing bubble observations of 1999 to 2009, I ran a new regression, similar to Dr. Sheppard’s regression except for removal of the 1999 to 2009 observations. The results are presented in Table 6 of my report and show that the negative effect of being in the “treatment group” is no longer statistically significant and the sign of the coefficient is actually reversed (0.00874), which implies that returns are actually higher in the “treatment group.” Tolley Report at 43 (ENT000144).

I also applied these steps to remove both the 1984 to 1987 price surge and the 1999 to 2009 housing bubble and the regression results are presented in Table 7 of my report. Tolley Report at 44 (ENT000144). The coefficient of “Sale in treatment group” indicates that being in the “treatment group” actually raises the rate of return approximately 3.5 percent instead of lowering it as Dr. Sheppard claims. Tolley Report at 44 (ENT000144).

In summary, Dr. Sheppard’s regression results do not stand up to the test of removing the most obviously inappropriate observations. Dr. Sheppard has based his property value estimate on an effectively nonsensical regression.

Q151. Please describe the error in Dr. Sheppard’s selection or definition of the “event” that caused a possible decline in property values.

A151. (GST) Dr. Sheppard’s choice of the “event” causing a possible decline in property values is incorrect. As noted, he designates 1974 to 1976, when IP2 and IP3 commenced operations, as his “treatment period” or event window. Dr. Sheppard asserts that the expansion of the Indian Point site is “a single significant change in the community whose location and timing can be determined unambiguously.” December 2011 Sheppard Report at 3 (NYSR00231). But Dr. Sheppard fails to show his event’s timing “can be determined unambiguously.” 2011 Sheppard Report at 3 (NYSR00231). Specifically, Dr. Sheppard has neglected anticipatory considerations. That IP2 and IP3 were going to commence operations was well known in advance of Dr. Sheppard’s selected dates. Thus, adverse property value impacts, if any, would have occurred well before 1974.

Q152. What do you mean by “anticipatory” considerations?

A152. (GST) It is universally accepted by economists that prices are affected by news of events. Dr. Sheppard himself states that the change in housing value occurs at the moment that buyers and sellers in the marketplace become aware of a change. December 2011 Sheppard Report at 3 (NYSR00231). The phenomenon of housing prices going up or down in advance of construction of a facility, in response to news leading to anticipation of construction, has been documented many times over. *See, e.g.,* P. Colwell, C. Dehring, and N. Lash, *The Effect of Group Homes on Neighborhood Property Values*, 76 *Land Econ.*, 615 (2000) (ENT000167); D. Damm, S. Lerman, E. Lerner-Lam, and J. Young, *Response of Urban Real Estate Values in Anticipation of the Washington Metro*, 14 *J. of Transp. Econ. & Pol’y* 315 (1980) (ENT000168); C. Dehring, C. Depken and M. Ward, *The Impact of Stadium Announcements on Residential*

Property Values: Evidence From a Natural Experiment in Dallas-Fort Worth, 25 *Contemporary Econ. Pol’y*,” 627 (2007) (ENT000169).

Thus, if IP2 and IP3 operations were expected to have a disamenity effect, then buyers would have taken account of the effect when news occurred, giving rise to anticipatory effects prior to construction completion. Dr. Sheppard makes no attempt to define the correct “event” as when there would have been such property value effects (*i.e.*, the time when the public became aware that IP2 and IP3 would be constructed).

Q153. So any property value impacts would have taken place earlier than the 1974 to 1976 period?

A153. (GST) Yes. The “event” should have been defined as starting many years prior to the 1974 to 1976 period. Area residents were aware of Consolidated Edison’s plans to build the Indian Point facility as early as 1954. *See Indian Point Park Bought By Edison*, N.Y. Times, Oct. 9, 1954, at 18 (ENT000170); *Edison Will Build Atom Power Plant*, N.Y. Times, Feb. 11, 1955, at 1 (ENT000171). Plans to expand the facility to include IP2 and IP3 were known as early as 1965 and 1967, respectively. *See M. Folsom, 2nd Atom Generator Planned by Con Ed*, N.Y. Times, Oct. 30, 1965, at 1 (ENT000172); P. Millones, *Con Ed Approves 3d Nuclear Unit at Indian Point*, N.Y. Times, Apr. 26, 1967, at 50 (ENT000153).

Residents of the community certainly knew about IP2 well before the news that the facility had commenced operations. *See, e.g., ConEd Pouring Half Block-Long Base for Atom Plant*, N.Y. Times, Dec. 16, 1966 (ENT000173); *Con Edison Leases Nuclear Fuel Cores*, N.Y. Times, May 27, 1971 (ENT000174). If there were disamenity effects of nuclear activities, then Dr. Sheppard fails to sort out the timing of such announcements and other activities, including, for example, the earlier IP1 construction, operation, and shutdown.

Q154. Please describe any other methodological errors by Dr. Sheppard in employing his study methodology that he analogizes to an “event study.”

A154. (GST) As noted previously, Dr. Sheppard characterizes his approach as being similar to an “event study.” December 2011 Sheppard Report at 3 (NYSR00231). Event studies are most common in financial analysis to estimate a discrete event’s impact on security prices (e.g., how an announcement that two firms will merge affects their stock prices). Tolley Report at 45 (ENT000144). Important literature establishes appropriate event study methodology, of which Dr. Sheppard shows no awareness. *See, e.g.,* Mark P. Kritzman, *What Practitioners Need to Know About Event Studies*, 50 *Fin. Analysts J.* 17 (1994) (ENT000175).

I was unable to uncover any previous peer reviewed “event studies” for housing. Nor have I uncovered any studies, whether called event studies or not, that employ Dr. Sheppard’s approach of trying to explain returns using a regression based on separating returns into a “treatment group” and “control group.” Dr. Sheppard’s approach is apparently unprecedented and unsubjected to broader economic community scrutiny.

A review of this literature indicates that even a well-designed event study cannot be validly applied to an event unless the event occupies a very small time window and can be unambiguously defined. The points apply to any study that purports to attribute financial return to a single assumed event, as Dr. Sheppard does.

Q155. Please explain why the event needs to take place in a small time window.

A155. (GST) When news unrelated to the event being studied is released in the same time period as the event, this confounding information has the potential to “distort or camouflage the effect of the event of interest on the security’s return.” M.Kritzman, *What Practitioners Need to Know About Event Studies*, 50 *Fin. Analysts J.* 17 (1994) (ENT000175). Isolating the

effect of an event from the effects of other events is perhaps the most important requirement for using the event study method. The longer the timeframe, the more difficult it is to control for confounding events, the failure of which “causes serious doubts about the validity of the empirical results and calls into question any conclusions drawn.” A. McWilliams and D. Siegel, *Event Studies in Management Research: Theoretical and Empirical Issues*, 40 Acad. of Mgmt. J. 3 (1997) (ENT000176).

Q156. How does a typical, well-designed event study compare to Dr. Sheppard’s event window?

A156. (GST) The typical event study uses sampling intervals of one day. As Campbell et al. note, “the decrease in power [of the test statistic] going from a daily interval to a monthly interval is severe.” J. Campbell, A. Lo, and A. MacKinlay, *The Econometrics of Financial Markets*, 175 (1997) (ENT000177). If a monthly window is used, then excess returns on the announcement date may be overwhelmed by “noise in the monthly returns,” meaning that the effect of the information of the event being studied may be “hidden in the noise during” the test period. J. Binder, *Measuring the Effects of Regulation with Stock Price Data*, 16 RAND J. of Econ., 167 (1985) (ENT000178).

Q157. So is Dr. Sheppard’s event too long?

A157. (GST) Yes. Certainly, a year or more is far too long an event. In a review of corporate litigation event studies, Bhagat and Romano found an event window’s length detrimentally affects its statistical power, stating that “it is very difficult to have much confidence in the results of event studies that consider long-horizon returns of several years.” S. Bhagat and R. Romano, *Event Studies and the Law: Part I: Technique and Corporate Litigation*, 4 American L. and Econ. Rev., 164 (2002) (ENT000179). In fact, when using even a one-year

event window, there is a danger “that the period under examination is so long that other events might occur which could incorrectly confirm or refute the test hypothesis.” R. Smith II, *The 1958 Automobile Information Disclosure Act: A Study of the Impact of Regulation*, 4 J. of Indus. Econ. 28, 392 (1980) (ENT000180).

Furthermore, Binder discusses event studies where the event date is not precisely defined and concludes that “for regulatory events where the event date is not known, the event study methodology appears to have little statistical power to detect the abnormal returns because the formal announcements in the process are generally anticipated by the market.” J. Binder, *The Event Study Methodology Since 1969*, Review of Quantitative Fin. and Accounting, 123 (1998) (ENT000181). Campbell et al. came to the same conclusion, stating that “[i]n cases where the date is difficult to identify or the event is partially anticipated, event studies have been less useful.” J. Campbell, A. Lo, and A. MacKinlay, *The Econometrics of Financial Markets*, 179 (ENT000177).

Q158. Does the length of Dr. Sheppard’s event make his results unreliable?

A158. (GST) Yes. Dr. Sheppard’s control group and event definition problems exemplify the difficulty in making any inferences using “event analysis” not involving very short-lived events. Dr. Sheppard fails to account for or even mention confounding events such as the oil embargo and the associated 1973 to 1975 recession as well as the many different socioeconomic factors unrelated to the presence of Indian Point that affect the rate of return to housing in the area. To use the long period associated with the historical start of IP2 and IP3 operations as an “event” to make inferences, as Dr. Sheppard has tried to do, is essentially impossible. Thus, Dr. Sheppard’s unprecedented methodology cannot be considered reliable.

Q159. Are there any other approaches that Dr. Sheppard could have taken to estimate any potential Indian Point property value impacts?

A159. (GST) Absolutely. Given the numerous, independent reasons invalidating Dr. Sheppard's unprecedented event study-like approach, the established method to perform such an evaluation would have been to use hedonic regression. This decision not to perform a hedonic evaluation is puzzling. Not only have Dr. Sheppard's prior reports focused almost exclusively on hedonic techniques, but the data used in his evaluation was sufficient for such an approach.

Q160. How do you know that Dr. Sheppard had sufficient data to perform a hedonic analysis?

A160. (GST) Through the discovery process, I obtained Dr. Sheppard's underlying data. After correcting obvious data errors and adding other relevant variables from property assessment records also produced by NYS in discovery, I was able to perform a hedonic analysis, which is presented in Section 6-8.1 of my report entitled, "Property Value Effects of Indian Point License Renewal" (ENT000144).

Q161. Please describe the methodology of your Indian Point-specific property value impact assessment using Dr. Sheppard's data.

A161. (GST) To perform the hedonic analysis that Dr. Sheppard could have, I assembled a dataset based on Assessor's property cards. Specifically, using the information in Dr. Sheppard's December 2011 dataset and the Assessor's property cards also used by Dr. Sheppard, I assembled a data sample of sales of 283 single family residential properties in Buchanan, Cortlandt, and Peekskill, within 5 kilometers from Indian Point. Multiple occupancy properties, commercial properties, and other anomalies were excluded. Tolley Report at 48

(ENT000144). While properties in Dr. Sheppard's December 2011 analysis may appear in his regression more than once, I included only the final sale of each relevant property in my regression using his data. Tolley Report at 48 (ENT000144). I excluded from the sample sales that occurred prior to the first quarter of 1999, eliminating the few properties that only had transactions before that time. Tolley Report at 48 (ENT000144).

As with the MLS regression described earlier in my testimony, I matched these observations with data from the 2000 U.S. Census based on the Census Block Group ID, and spatial variables were created using the U.S. Census Shape files in ArcGIS. Tolley Report at 48 (ENT000144). I again calculated a variable measuring the estimated per-household PILOT payments. Tolley Report at 48 (ENT000144).

Using this data set, I ran a regression using STATA v9.2 to estimate the relationship between the sale price of the property and a set of eight explanatory variables: Distance to Indian Point; Distance to Indian Point Squared; Median Income; House Age; whether it was Condo/Townhome; Distance to Nearest Commuter Rail Station; 2011 PILOT Payments; and the Year and Quarter of Sale. Tolley Report at 48-49 (ENT000144). This last variable was not needed in my earlier MLS regression because all of the data observations were collected on the same date in July 2011.

Q162. Please describe the results of your Indian Point-specific property value impact assessment using Dr. Sheppard's data.

A162. (GST) The full regression results are shown in Table 8 of my report. Tolley Report at 49 (ENT000144). While the coefficients of Distance to Indian Point and Distance to Indian Point Squared have the expected pattern for a disamenity, they are statistically insignificant and thus do not support Dr. Sheppard's claim that Indian Point adversely impacts

property values. Tolley Report at 49 (ENT000144). In other words, the lack of statistical significance means that the probability that the distance coefficients are different from zero is too low to provide reliable evidence that Indian Point depresses property values. Tolley Report at 49 (ENT000144).

When results for the other coefficients are compared to the results from my MLS regression, it is clear that the results in the two regressions are highly reasonable and consistent. Although the signs are different for the Distance to Indian Point coefficients, neither are statistically significant. Tolley Report at 49 (ENT000144). Differences that can be seen in the other coefficients in the two regressions can be due to the fact that the sampling criteria are different (*e.g.*, time period and geographical differences). Tolley Report at 49 (ENT000144).

In my view, the two best pieces of evidence available on the effects of Indian Point on property values are the two hedonic regressions. Both regression results show that there is no scientific basis that Indian Point depresses property values.

Q163. Please describe any other problems you identified with the December 2011 Sheppard Report.

A163. (GST) My preceding testimony has discussed particularly egregious errors in Dr. Sheppard's December 2011 Report, each one of which is sufficient to discredit his conclusion. Beyond these fundamental errors, a litany of additional technical errors further calls into question the accuracy of Dr. Sheppard's results. A partial list of these additional errors, discussed in more detail in Section 6-9 of my report (ENT000144), is as follows:

- A logical consequence of Dr. Sheppard's theory is that the average annual return to a property owner holding real estate during the 1974-76 "treatment" period is affected by the number of years prior to and following the treatment period. Average annual

returns would be depressed more if holdings included only a few years of normal returns before or after 1974-1976 than if holdings were for more years before and after when normal returns could be realized for a longer time, leading to a higher average annual return because of the greater weight of normal as opposed to depressed returns. Dr. Sheppard's failure to account for this effect introduces measurement error in the dependent variable of his regression reducing the reliability of the result.

- The entire theoretical basis of Dr. Sheppard's approach is not explained adequately and contains errors.
- Free-standing homes are under-represented in Dr. Sheppard's sample relative to condos and townhomes; and
- Even if his new unprecedented estimation method was accepted, there are inaccuracies in Dr. Sheppard's conversion of a supposed 27 percent decline in property values to a \$1.07 billion property value loss.

See Tolley Report at 50-52 (ENT000144).

IX. CONCLUSION

Q164. Please summarize your testimony and the bases for your conclusions regarding Contention NYS-17B.

A164. (GST, DPC, CWR) The FSEIS assessment of offsite land use impacts resulting from the proposed license renewal and from the no-action alternative is consistent with NRC guidance, 10 C.F.R. Part 51 regulations, and NEPA. Based on the NRC's well-established, comprehensive approach for assessing land use impacts, the FSEIS appropriately focused on the two license renewal effects most likely to cause offsite land use impacts—tax revenue effects

and population change effects. The NYS claim of additional, allegedly unexamined property value-driven land use impacts lacks merit for the following reasons:

- Prior NRC Staff Indian Point-specific reviews demonstrate that significant property value impacts and thus any property value-driven land use impacts are unlikely during license renewal. Moreover, pre-established land use development patterns are anticipated to continue in the future, and public services and regulatory controls are in place to support and guide land use and development. Thus, even if there were hypothetical future property value changes, any corresponding offsite land use impacts are also unlikely to be significant in light of historic land use patterns, current land use regulations and zoning ordinances, tax rates and incentives, population growth trends, and pending and proposed development plans.
- The absence of any adverse property value impacts has been verified by Indian Point-specific property values assessments. These assessments use hedonic price modeling, the well-accepted and reliable methodology for determining property value impacts. These assessments demonstrate that proximity to Indian Point has no discernible adverse impact on residential property values, a conclusion that is consistent with peer-reviewed studies that have focused on the property value effects that nuclear power plants (as distinct from other facility types) have on surrounding property. The absence of any adverse property value impacts of proximity to the site means that there could be no property value-driven land use impacts, which again demonstrates the FSEIS appropriately focused on tax revenue-driven and population change-driven offsite land use impacts.

Furthermore, for multiple, independent reasons, Dr. Sheppard's various and evolving claims of adverse property value impacts also lack merit. Dr. Sheppard's reports contain numerous methodological and data errors. Dr. Sheppard's original reports are based on the results from a study involving a coal plant that is simply inapplicable to the area surrounding Indian Point. Using this coal-plant derived property value impact estimate, in comparing the impacts of license renewal to the impacts of the no-action alternative, Dr. Sheppard makes unjustifiable assumptions about the expected length of the decommissioning period; the discounting of future events; and the level of PILOT payments, property taxes, and other taxes during the license renewal period and after IP2 and IP3 cease operations.

In his most recent report, Dr. Sheppard inexplicably abandons his reliance on the coal plant approach and embarks on unprecedented and illogical approach that he analogizes to an event study. Not only does Dr. Sheppard's approach contain an extraordinary number of data errors, but his methodology is completely inappropriate. In particular, Dr. Sheppard fails to use a realistic "control" group; incorrectly defines the period of 1974 to 1976 as the "event" of interest; and violates a number of important methodological requirements for a valid event study. Dr. Sheppard could have avoided these methodological errors and applied the well-established hedonic approach. Dr. Sheppard's own data would have been more than adequate for the hedonic approach and would have corroborated the findings from other nuclear plant studies and from Dr. Tolley's own MLS hedonic regression analysis demonstrating that Indian Point has no discernible effect on property values.

In summary, it is clear that Dr. Sheppard's testimony contains nothing that calls into question NRC Staff's conclusion that removal of the nuclear presence under the no-action alternative would result in SMALL offsite land use impacts.

Q165. Does this conclude your testimony?

A165. (DPC, CWR, GST) Yes.

Q166. In accordance with 28 U.S.C. § 1746, do you state under penalty of perjury that the foregoing testimony is true and correct?

A166. (DPC, CWR, GST) Yes

Executed in accord with 10 C.F.R. § 2.304(d)

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